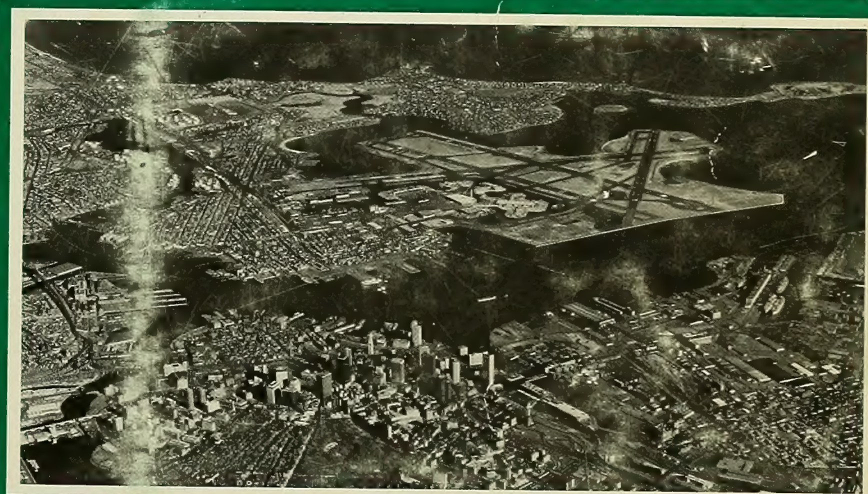
FHWA-MA-EIS-82-02-F

Final Environmental Impact Statement and Final Section 4(f) Evaluation

Third Harbor Tunnel, Interstate 90/ Central Artery, Interstate 93



Boston, Massachusetts

Volume I

Federal Highway Administration
Massachusetts Department of Public Works

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THIRD HARBOR TUNNEL. INTERSTATE 90/CENTRAL ARTERY, INTERSTATE 93
BOSTON, MASSACHUSETTS

Final Environmental Impact Statement/Report and Final Section 4(f) Evaluation
Submitted Pursuant to 42 U.S.C. 4332(2)(C) and 49 U.S.C. 303 by the
U.S. Department of Transportation, Federal Highway Administration
and
Massachusetts Department of Public Works

Cooperating Agencies

U. S. Environmental Protection Agency
U. S. Army Corps of Engineers
U. S. Coast Guard
U. S. Department of the Interior
U. S. Department of Housing and Urban Development
Federal Aviation Administration
AMTRAK
CONRAIL
Massachusetts Executive Office of Environmental Affairs
Massachusetts Department of Environmental Quality Engineering
Metropolitan Area Planning Council
Massachusetts Port Authority
Massachusetts Turnpike Authority
Massachusetts Historical Commission

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C.D.Reagan
Federal Highway Administration

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This document describes and evaluates the Commonwealth's Preferred Alternative for providing increased highway capacity across Boston Harbor and improving the Central Artery in Boston, Massachusetts. The Preferred Alternative consists of construction of a four-lane Third Harbor Tunnel (I-90), from the Southeast Expressway and present terminus of the Massachusetts Turnpike Extension (I-90) at the Central Artery (I-93) in Boston to Logan Airport and Route 1A in East Boston via the Seaport Access alignment. This alignment therefore provides a Seaport Access facility to the developing Northern Avenue industrial area of South Boston. The Preferred Alternative also includes construction of a widened (eight to ten lanes) and depressed Central Artery (I-93), from its terminus with the Southeast Expressway to the Charles River/City Square area of Charlestown. The Preferred Alternative also provides express bus/high occupancy vehicle facilities linking the South Station Transportation Center with Logan Airport and the Southeast Expressway.

This document is also prepared in accordance with the Massachusetts Environmental Policy Act (MEPA), EOEA No. 4325

A. DESCRIPTION AND PURPOSE OF THE PROPOSED ACTION

The Commonwealth of Massachusetts, in cooperation with the United States Department of Transportation, Federal Highway Administration, proposes to depress and widen the Central Artery, from the Massachusetts Turnpike interchange northerly to an interchange with Interstate 93 and Route 1, and to construct an extension of Interstate 90 (Massachusetts Turnpike) from its present terminus at the Central Artery across Boston Harbor to a new terminus at Logan Airport in East Boston. The I-90 extension will consist of a Seaport Access Roadway through the northern portion of South Boston connecting to a Third Harbor Tunnel to East Boston. Exclusive bus/high occupancy vehicle ramps will also link the South Station Transportation Center to Logan Airport and to the Southeast Expressway. This proposed action was designated as the Preferred Alternative following evaluation of a set of alternative actions. The other alternatives considered are described in Section C of this SUMMARY.

Context

The possibility of major investment in the Central Artery and an additional cross harbor facility has been under discussion for several decades. The Artery was constructed between 1954-1959, as part of a transportation program for the Boston region which was generated early in the post-World War II period, and which had recommended construction of numerous expressway facilities inside Route 128.

This program had called for construction of additional radial and inner belt expressways which were to connect with the already congested Central Artery. The Boston Transportation Planning Review concluded in 1972 that the provision of high quality radial transportation in the core area should be primarily by public transportation, with selected improvements to the regional highway network to help solve critical transportation problems in Boston's core area. Among the latter were the possible reconstruction of the Central Artery, and the possible addition of a third harbor crossing.

Over the past decade, policy initiatives have largely carried out the ambitious public transportation construction program defined in the early 1970s. During this time, improvements to the Central Artery and an additional cross harbor facility have been under active study; these facilities have been examined in an Area Planning Study, a Corridor Planning Study, and are now the subject of this Final Environmental Impact Statement/Report (FEIS/FEIR).

Purpose of Action

A major purpose of the highway project is to improve the flow of traffic using the Central Artery and the numerous other regional highway facilities connecting with it. These facilities service through traffic; traffic to downtown; traffic traveling within the downtown on surface streets; traffic to and from East Boston, Logan Airport and the North Shore; and traffic destined for the developing seaport area in the vicinity of Northern Avenue/Commonwealth Flats in South Boston. Unless improvements are made to increase the capacity of the Artery and revise ramp connections and the surface arterial in the downtown area, Artery congestion will continue and worsen, severely affecting the operation of Boston's regional network in the core area.

Another purpose of the proposed action is to provide increased cross-harbor capacity through construction of a Third Harbor Tunnel, thus augmenting the capacity currently available via the Mystic-Tobin Bridge and Callahan/Sumner Tunnels.

Still another purpose of the

proposed action is to increase accessibility to the Boston seaport area by constructing Interstate Route 90 easterly of its current terminus at the Massachusetts Turnpike/Central Artery interchange towards the Commonwealth Flats area at Northern Avenue and the new developments emerging there. A specific objective of this aspect of the proposed action is to establish improved connections for truck traffic seeking access to this area and by doing so, to reduce truck traffic on South Boston's residential streets.

The proposed action will improve bus/transit service in the City of Boston. Exclusive bus ramps will be provided to and from the South Station Transportation Center with direct connections to points south and west, and to Logan Airport.

Project Description

The one-way tunnel in Fort Point Channel will carry all northbound traffic to a widened and depressed Central Artery. The Central Artery, from the north portal of the Dewey Square tunnel to the Massachusetts Turnpike area, will be converted to southbound operation, with the exception of one lane which will continue to serve northbound traffic. This aspect of the improvements to the Central Artery -- segregating northbound traffic in the Fort Point Channel from southbound traffic in the modified Dewey Square tunnel -- is referred to in this FEIS/FEIR as the "split alignment". North of Dewey Square, the Artery will be widened and constructed in a tunnel through downtown. The total length of the project on the Central Artery is approximately 3.0 miles.

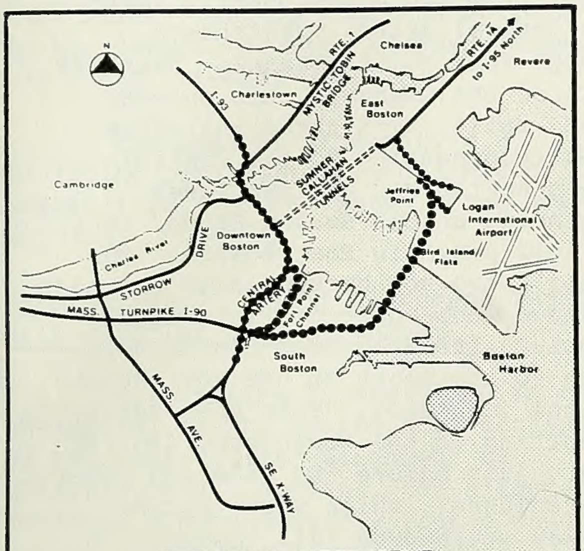
The depressed and widened Central Artery will have four to five lanes of traffic in each direction (in contrast with the current three) as well as improved ramp connections in the downtown area. The present elevated structure will be removed, and a continuous surface arterial will be reconstructed, connecting the expanded Artery below, along with its new ramp connections, with the city street system at the surface. The High-Level Bridge over the Charles River will be replaced as part of this project to provide an improved connection between Interstate Route 93, Route 1 and the Central Artery. Improved connections with Storrow Drive and with the Callahan/Sumner Tunnels will also be provided.

Almost 20 acres of air rights development parcels will be created by the depression of the Central Artery.

The Third Harbor Tunnel will include a two-way, four-lane, limited-access toll highway, approximately 3.9 miles in length, with direct connections to the Massachusetts Turnpike, Southeast Expressway, Central Artery, Logan Airport and Route 1A to the north. This highway will follow a seaport access alignment easterly from the Massachusetts Turnpike/Central Artery interchange, across Fort Point Channel at its southerly point to the Commonwealth Flats area in South Boston. Connections to Northern Avenue will be provided for both northbound and southbound traffic. The alignment continues easterly to a portal near the present location of Commercial Union, and curves north to pass between Pier 5 at the Dry Dock and the western edge of the Boston Marine Industrial Park (BMIP), to continue beneath Boston Harbor to a portal at Bird Island Flats. Connections are provided to Route 1A north as well as to the Airport roadways. An open one-way (southbound) toll plaza will be located on Commonwealth Flats.

The Seaport access route will provide access to Commonwealth Flats/Seaport facilities and to Logan Airport from the regional highway system.

Construction costs of the total project are $2.56 billion, including right-of-way acquisition costs.



PREFERRED ALTERNATIVE

B. OTHER SIGNIFICANT GOVERNMENT ACTIONS IN THE AREA

Other significant actions or proposed actions by federal governmental agencies on the Boston side of the Harbor in the project area include the following:

1. Federal Highway Administration (FHWA)/Massachusetts Department of Public Works (MDPW) reconstruction of the Southeast Expressway/Central Artery south of the Massachusetts Turnpike interchange, including addition of a traffic management lane;

2. FHWA/MDPW Central Artery North Area Project, including reconstruction of the Interstate Route 93/U.S. Route 1 interchange;

3. HUD assisted urban renewal project, including site improvements, roadways and utilities in the North Station area; U.S. Urban Mass Transportation Administration (UMTA)/Massachusetts Bay Transportation Authority (MBTA) improvements to Green Line and commuter rail at North Station; GSA Federal office building;

4. UMTA/MBTA improvement projects in the South Cove/South Bay Area, including the South Station Transportation Center and the Wye Connector;

5. FHWA/MDPW/City of Boston Transportation Systems Management improvements in the Dewey Square Area.

6. Several related combined sewer overflow (CSO) treatment, collection, and outfall facility projects by the U.S. Environmental Protection Agency (EPA)/Metropolitan District Commission (MDC)/Boston Water and Sewer Commission (BWSC) in the South Bay, Fort Point Channel, and Waterfront areas;

7. FHWA/MDPW Northern Avenue Bridge Replacement Project.

Within Boston Harbor, other significant proposed actions include:

8. U.S. Coast Guard Special Anchorage Area at the mouth of Fort Point Channel;

9. U.S. Army Corps of Engineers maintenance dredging and possible deepening of the Boston Harbor Shipping Channel.

On the East Boston side of the harbor, other significant proposed Federal actions include:

10. Related EPA/MDC/BWSC Combined Sewer Overflow collection and treatment projects along the south waterfront and on Bird Island Flats at Logan Airport.

11. FAA/Massport/private airport-related improvements to Bird Island Flats at Logan Airport, including airfield facilities, surface access, public waterfront park and mixed-use development.

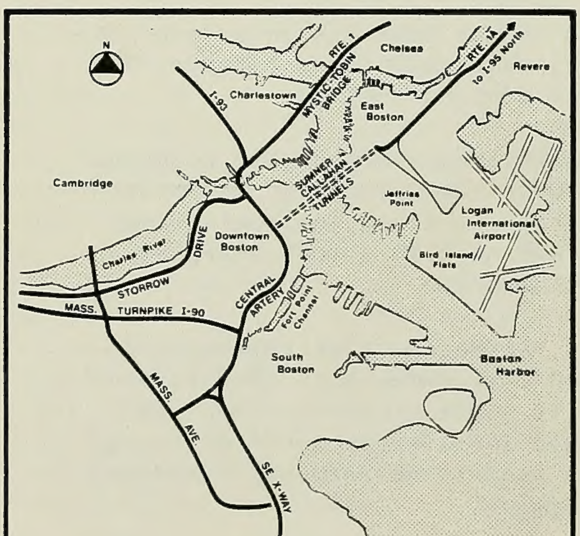
Other non-federal projects in the area include the private Rowe's Wharf Development on a waterfront parcel owned by the Boston Redevelopment Authority (BRA); cargo and mixed use developments on Massachusetts Port Authority (Massport) property at Bird Island Flats; and the East Boston Piers development being planned by the

BRA and Massport.

C. OTHER MAJOR ALTERNATIVES EVALUATED

Alternative 1: No-Build With Central Artery Deck Replacement

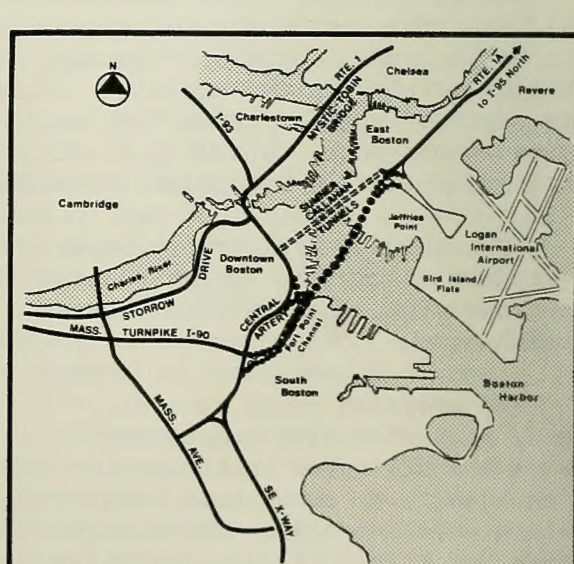
Alternative 1 involved no new construction of transportation facilities except for the separate projects described above in Section B. The Central Artery would be redecked, and selected modifications to existing ramps and acceleration/deceleration lanes would be made; however, no additional through capacity would result. The No-Build Alternative is the base case against which the other alternatives are compared in the Draft Environmental Impact Statement (DEIS/DEIR), Supplemental Draft Environmental Impact Statement (SDEIS/SDEIR) and the FEIS/FEIR. Construction cost for this alternative would be $33 million. Tolls would not change.



ALTERNATIVE 1

Alternative 2: Split Alignment; Railroad Alignment

Alternative 2, evaluated in the DEIS/DEIR, involved the construction of a one-way, five-lane northbound tunnel from the Massachusetts Turnpike/Central Artery interchange through Fort Point Channel. Near the mouth of the Channel, this one-way tunnel split, with three toll-free lanes reconnecting to the Central Artery northbound and two lanes continuing across Boston Harbor to a new toll plaza in East Boston. The tunnel's two southbound lanes ran next to the northbound lanes in a single structure from the East Boston toll plaza to the mouth of the Fort Point Channel in Boston. They then split, connecting to the southbound Central Artery just before the existing Dewey Square Tunnel, which would become one-way southbound (six lanes). In East Boston, the tunnel would lie within the Conrail railroad right-of-way and industrial land next to Bremen Street, with an open toll plaza between Gove and Porter Streets. The tunnel would have connections to the Southeast Expressway, Central Artery, Massachusetts Turnpike and Frontage Road in South Boston (on ramp); Summer Street in Fort Point Channel (on ramp); and the Logan Airport access/egress roads and Route 1A in East Boston.



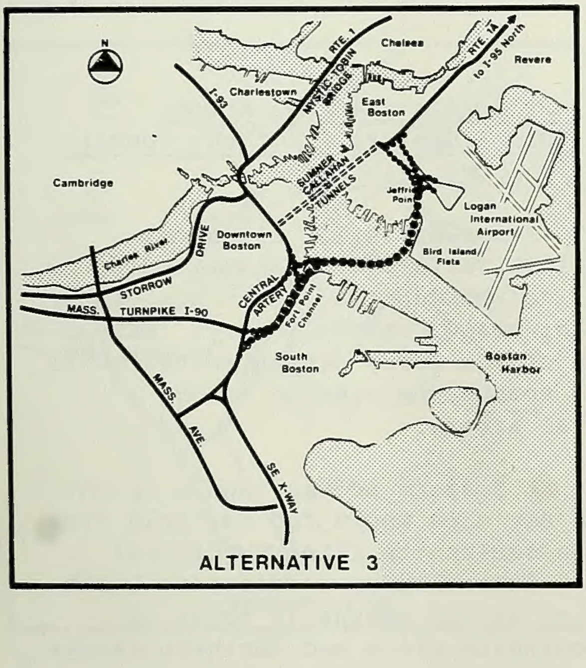
ALTERNATIVE 2

A new Dorchester Avenue would be constructed above the tunnel in Fort Point Channel, with connections to the Central Artery, Frontage Road, and cross streets.

The cost of Alternative 2, including construction and property acquisition, was estimated to be $749 million.

Alternative 3: Split Alignment Tunnel with Jeffries Cove Alignment

Alternative 3, evaluated in the DEIS/DEIR, on the Boston side consists of the same "split" alignment as Alternative 2. However, the alignment followed a more easterly course under Boston Harbor and Jeffries Cove, surfacing at Logan Airport with connections to the Airport access/ egress roads, and terminated at Route 1A near the existing Airport ramps. The cost of Alternative 3, including construction and property acquisition, was estimated to be $945 million.



ALTERNATIVE 3

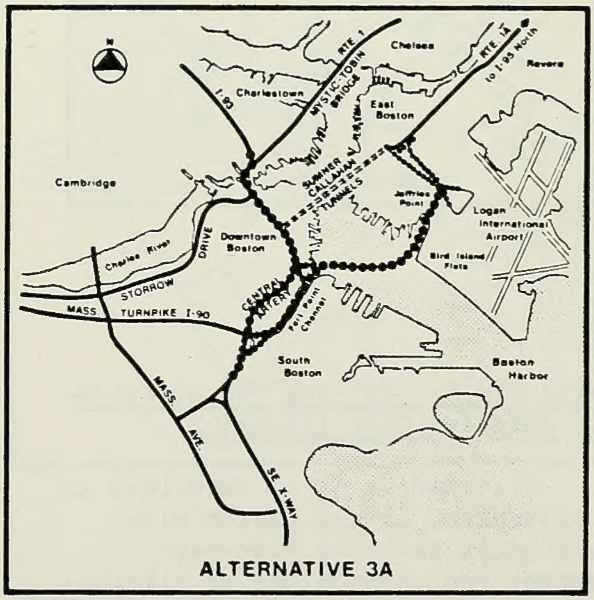
Alternative 3A: Central Artery Depression with Split Alignment; Jeffries Cove Alignment Tunnel

Alternative 3A, evaluated in the Supplemental DEIS/DEIR, included a one-way split alignment tunnel in Fort Point Channel which would carry all northbound traffic to a widened and depressed Central Artery and to a cross-harbor tunnel running to the Airport via Jeffries Cove. All lanes of the Dewey Square tunnel would carry southbound traffic from the Central Artery.

The Third Harbor Tunnel would be a two-way four-lane facility, connecting the depressed Central Artery with Logan Airport and Route 1A in East Boston. A local on-ramp to the tunnel at Summer Street and an off-ramp (from the Central Artery) at Purchase Street would be provided. A toll plaza would be located at Logan Airport.

A surface arterial would be constructed above the depressed Central Artery. Ramp connections would be modified, and almost 20 acres of air rights development parcels would be created.

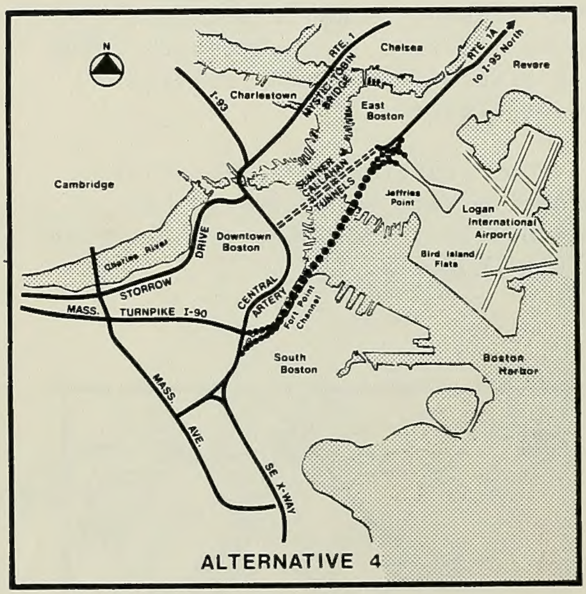
Construction costs for this alternative were estimated to be $1.895 billion, including right-of-way acquisition costs.



ALTERNATIVE 3A

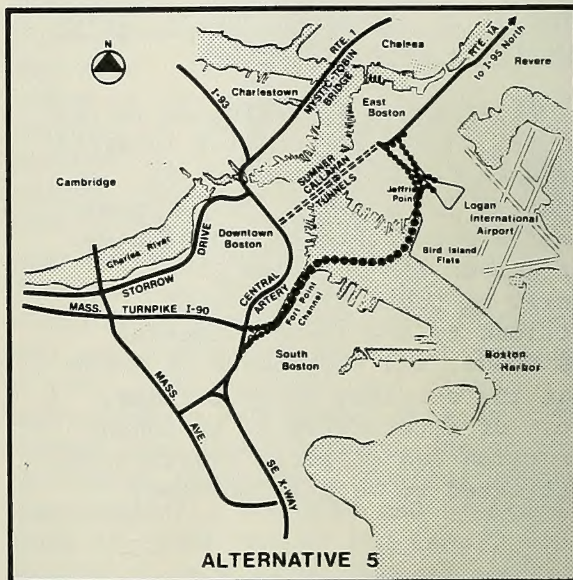
Alternative 4: Two-way Tunnel Alignment; Railroad Alignment

Alternative 4, as described in the DEIS/DEIR, involved the construction of a two-way four-lane tunnel from the Massachusetts Turnpike/ Central Artery interchange in Boston through Fort Point Channel, across Boston Harbor and into East Boston along the same westerly "railroad" alignment as Alternative 2. There were no direct connections with the Central Artery north of the Massachusetts Turnpike interchange. Other connections were generally the same as those for Alternative 2, with additional off-ramps at Summer Street in Fort Point Channel and Albany Street in the South End. The cost of Alternative 4, including construction and property acquisition, were estimated to be $735 million.



Alternative 5: Two-Way Tunnel Alignment; Jeffries Cove Alignment

Alternative 5, as described in the DEIS/DEIR, on the Boston side consisted of the same "two-way" alignment and connections as Alternative 4. The Third Harbor Tunnel continued across Boston Harbor into Logan Airport along the same easterly alignment as Alternative 3. All connections in East Boston were identical to those for Alternative 3. The cost of Alternative 5, including construction and property acquisition, was estimated to be $927 million.



Alternative 5A: Central Artery Depression; Seaport Alignment Tunnel; Jeffries Cove Alignment

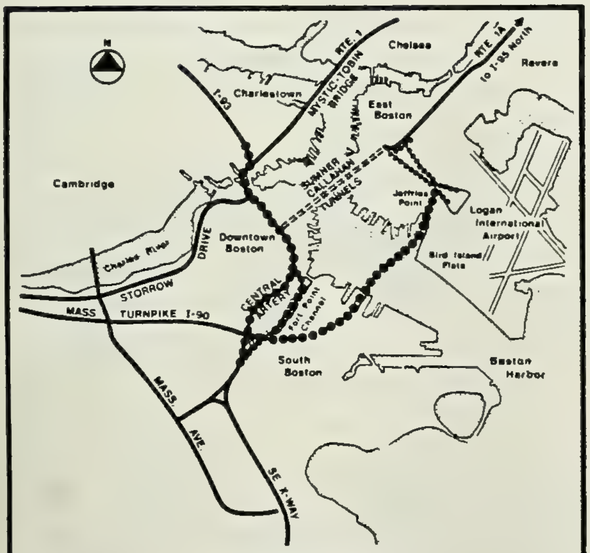
A one-way split alignment tunnel in Fort Point Channel would carry northbound traffic to a widened and depressed Central Artery. All lanes of the Dewey Square Tunnel would carry southbound traffic on the Central Artery.

A Seaport access tunnel in the South Bay area would run easterly from the Massachusetts Turnpike/Central Artery interchange, across Fort Point Channel at its southerly point to Commonwealth Flats and Northern Avenue in South Boston. Connections to Northern Avenue would be provided for northbound and southbound traffic. The tunnel alignment would continue to a portal between Commonwealth Pier 5 and Pier 6 to cross under Boston Harbor to a portal at Logan Airport

via Jeffries Cove. A toll plaza would be located on Airport property, and connections to Route 1A North would be provided, as for Alternative 3A.

Modifications to the Central Artery, including the number of lanes of the depressed Artery, the alignment, and the surface arterial street, were the same as in Alternative 3A.

The Seaport access route would provide access to Commonwealth Flats/ Seaport facilities and to Logan Airport from the regional highway system. Access to and from the depressed Central Artery would be the same as in Alternative 3A. The same quantity of developable land would be created over the Central Artery. Six additional acres of air rights in the South Boston area would also be created in this alternative. Construction costs for this alternative were $2.187 billion including right-of-way acquisition costs.

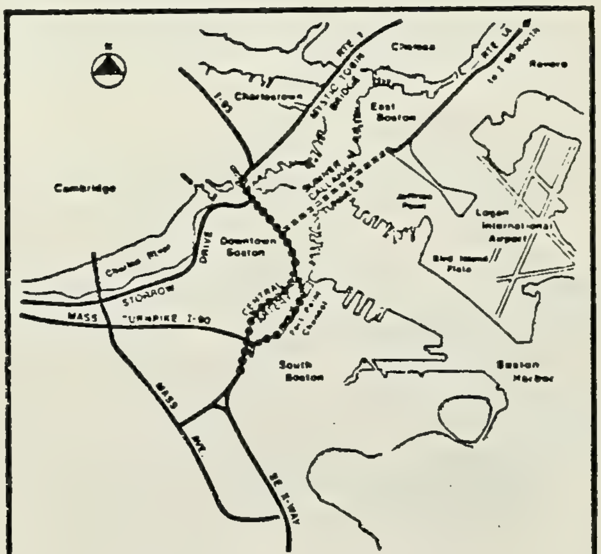


ALTERNATIVE 5A

Alternative 6: Central Artery Depression Without Third Harbor Tunnel

A one-way split alignment tunnel in Fort Point Channel would carry all northbound traffic to a widened and depressed Central Artery. All lanes of the Dewey Square tunnel would carry southbound traffic from the Central Artery. The project limits extend from the vicinity of the Massachusetts Turnpike interchange to the vicinity of the Interstate 93/Route 1 interchange.

The depressed Central Artery would have four lanes (plus acceleration and deceleration lanes) in each direction. Access/egress would be the same as for Alternatives 3A and 5A except for the addition of direct ramp connections between the existing tunnels and the southbound Central Artery south of the tunnels. The number of lanes of the surface arterial, the ramp connections from the depressed Artery to city streets in the downtown and the creation of development parcels above the depressed Central Artery would be similar to Alternatives 3A and 5A. Construction costs for this alternative would be $1.314 billion, including right-of-way acquisition costs.



ALTERNATIVE 6

Two-Lane Tunnel Concept (Alternative 5A Modified with Two-Lane Tunnel)

A one-way split alignment tunnel in Fort Point Channel would carry northbound traffic to a widened and depressed Central Artery. All lanes of the Dewey Square Tunnel would carry southbound traffic from the Central Artery. Access/egress to the depressed Central Artery would be the same as for Alternative 6, in that direct ramp connections would be provided between the Callahan/Sumner Tunnels and the southbound Central Artery south of the tunnels.

The Seaport Access tunnel would follow the same alignment through South Boston as for Alternative 5A Modified, and would have four lanes through Commonwealth Flats. The cross-harbor tunnel, however, would have a two-lane cross section. The connections in East Boston would be to the Airport roadway system only, with no direct connections to Route 1A north.

D. SUMMARY OF SIGNIFICANT BENEFICIAL AND ADVERSE IMPACTS

A summary of the beneficial and adverse environmental impacts of the Preferred Alternative, compared to the No-Build Alternative, is given below. A matrix at the end of this SUMMARY includes all of the alternatives for purposes of comparison.

Transportation

Traffic Volumes and Queues

In 2010, the Boston roadway system will carry significantly higher traffic volumes, on the order of 5 to 30 percent more than 1982 volumes. If capacity is not increased, the major links in the core area (Interstate Route 93, Mystic-Tobin Bridge, Central Artery north, Callahan/Sumner Tunnels, Central Artery south, the Massachusetts Turnpike, and Southeast Expressway) will see a substantial increase in hours of congested operation; where these roadways are congested for 1 to 8 hours per day in 1982, congested operations would last from 5 to 14 hours per day in 2010.

By providing additional lanes, the Preferred Alternative reduces the hours of congested operation significantly from 2010 No-Build or 1982 existing conditions. In 2010, the Preferred Alternative will result in congestion lasting from one to two hours per day on all key routes except the Southeast Expressway, which will experience about the same number of hours of congestion as the No-Build Alternative. Traffic volumes will be reduced on links which are currently overloaded, including the Callahan/ Sumner Tunnels and Central Artery south; links such as Interstate Route 93 and the Massachusetts Turnpike, which are currently underutilized, will carry more traffic. Furthermore, the Preferred Alternative will reduce Average Weekday Daily Traffic (AWDT) in the Callahan/Sumner Tunnels by 33 percent in 2010. Traffic volumes will decrease on the Mystic-Tobin Bridge, and will increase on Route 1A north of the Airport.

The elimination of the High-Level Bridge bottleneck, the widening of the Central Artery from six to eight lanes, and the provision of a Seaport Access tunnel provide substantial reductions in mainline congestion and queueing over the No-Build Alternative.

Person hours of travel on an annual basis will be reduced in the year 2010 with the Preferred Alternative by 17.6 million hours as compared to the No-Build Alternative.

Level of Service

The Preferred Alternative results in substantial reductions in the number of roadway links and local intersections operating at Level of Service (LOS) E or F in 2010. LOS F operations are anticipated at 54 percent of the No-Build Alternative major highway links and intersections in the 2010 AM peak hour. This percentage will be reduced to 14 percent with the Preferred Alternative.

Safety

The Preferred Alternative will improve the safety of the roadway network. Accident potential on the regional highway will be significantly reduced; accident potential on local streets will be slightly reduced. The Preferred Alternative also provides benefits for the movement of hazardous cargoes, especially for vehicles with origins or destinations in South Boston. Emergency vehicle access improvements are also substantial, in accordance with predicted reductions in travel time on the regional and local highway network.

Logan Airport

The Preferred Alternative will reduce traffic both north of the existing tunnels on Route 1A and for Airport users approaching from Interstate Route 93 and Storrow Drive. The Preferred Alternative will also cause substantial decreases in congestion on local East Boston routes leading to the Airport.

Public Transit

The Preferred Alternative provides exclusive bus ramps to and from the South Station Transportation Center, thus connecting this intermodal transfer facility to the regional highway network, resulting in a net increase in public transportation ridership to Logan Airport. Public transportation services will not be significantly interrupted during the construction phase of the Preferred Alternative.

Construction Staging

Traffic congestion during construction will be minimized by careful phasing of construction work. Six lanes will be kept in operation on the elevated Central Artery until the depressed mainline is open to traffic. Construction of the South Boston portion of the Third Harbor Tunnel will commence simultaneously with the work on the depression of the Central Artery. With this staging, the Third Harbor Tunnel will be available for use prior to the completion of the depressed Central Artery. This is particularly critical during the period when the Callahan/Sumner Tunnels are reduced in capacity while connections are being completed to the depressed Central Artery. The availability of the Third Harbor Tunnel will thus reduce traffic demands on the Central Artery during its reconstruction.

Redecking the Central Artery (No-Build Alternative) would have more significant impacts than the Preferred Alternative on the maintenance of regional expressway traffic. Although redecking involves fewer years of construction and less disruption of the surface streets under the Artery, the capacity of the elevated Central Artery would be significantly reduced during the same periods. It is not necessary to reduce capacity on the Central Artery during the construction of the Preferred Alternative.

Relocation Impacts

No residential units will be displaced by the Preferred Alternative, and therefore no residential relocations will be required.

The Preferred Alternative requires 31 partial or total takings, necessitating the relocation of 131 businesses and 4,400 employees. Of these relocations, a single property acquisition, the Anelex Building adjacent to North Station, accounts for 62 of the affected businesses and agencies, and 2,200 of the total number of employees affected by the project. (Design modifications now underway in the North Station area may reduce the number of business relocations.)

Land-Use Impacts

A direct impact of the widening and depression of the Central Artery is the creation of some 20 acres of new developable land which could

accommodate approximately 2.75 million square feet of development in downtown Boston, plus approximately 1 million square feet of parking. These parcels will be developed with land uses similar to those found on abutting parcels.

The Central Artery's profile also permits construction of a new surface street system, providing better traffic circulation.

Improving the Central Artery and adding a Third Harbor Tunnel may make other communities close to Boston, including Quincy, Milton, Chelsea and Revere, more attractive locations for industries depending on access to Logan Airport, as well as for service industries requiring access to downtown Boston.

The Preferred Alternative will have significant impacts on land use in the northern portion of South Boston. The Seaport access route, with direct connections to Logan Airport and the regional highway system, will enhance access to industrial development and increase land values. Commercial and residential development planned for parcels near Fort Point Channel will benefit from improved access and enhancement of pedestrian access. Parcels which are directly affected by the project will be reduced in value due to subsurface easements which will restrict future uses.

Community/Neighborhood Impacts

Long-Term

For most neighborhoods, the widening and depression of the Central Artery will generally improve pedestrian access and overall environmental conditions due to elimination of the elevated structure, improvements to traffic patterns, and reduced air and noise pollution.

The quality of life for residents of the Waterfront area will be improved as a result of the project. For North End residents, environmental conditions will improve; overall quality of life should also improve if neighborhood cohesion is maintained. Replacement of parking spaces lost in the North End and Waterfront will be provided by the project. The final location of the ventilation buildings will be chosen in such a way as to minimize localized air quality impacts.

Overall environmental conditions in East Boston are also expected to improve due to decreased traffic on local streets and improved air quality. Access to downtown Boston will be easier.

In South Boston, long term improvements in the quality of life will result from significant reductions in truck traffic on local streets.

Construction Period

During construction, adverse community impacts will occur along the corridors where construction takes place due to increased traffic detouring through and around these locations, and due to noise, dust, and vibration from the construction activities. Mitigating measures will be undertaken to ensure that these impacts, as well as changing traffic patterns and access points and loss of parking spaces during construction, will not pose significant problems for local residents and visitors. These measures will include prior replacement of parking spaces and the use of alternative traffic and pedestrian routes.

Economic Impacts

Long-Term

The Preferred Alternative will have beneficial impacts on the Boston SMSA regional economy because it will provide better regional traffic service for through traffic on the Central Artery, and for traffic to Logan Airport. Aggregate savings in travel time and costs will generate

regional economic benefits by improving accessibility for firms, employees, and consumers to the regional employment base and to major market areas within and beyond the region.

Improvements in regional traffic service will particularly benefit high-technology industrial growth, expected to occur in southeastern Massachusetts and northern Rhode Island; the regional financial industry concentrated in the Boston Central Business District; auto-dependent retail sales; and a variety of industries dependent upon time-sensitive access to Logan Airport. These improvements may enhance the climate for expanded investment (and employment) in each major economic sector.

Construction Period Impacts

Construction expenditures from the Preferred Alternative will generate significant industry sales, household earnings, and jobs throughout the regional economy. The Preferred Alternative will generate an estimated $4.3 billion in industry sales and household earnings and about 77,000 person-years of employment. Net increases in income tax receipts to the Commonwealth from aggregate construction impacts are expected to total approximately $76 million.

Completion of construction of the Third Harbor Tunnel will minimize adverse construction effects on access to and from Logan Airport, such as delays in air freight movement of certain manufactured and other products.

While access to the Downtown Crossing shopping area from the south, west, and north will not be significantly affected during construction, some dampening of retail sales to auto-dependent retail shoppers in the downtown area is expected. Construction disruption is expected to affect employee commuting by auto, but diversions to mass transit and/or peak hour spreading are expected to minimize overall impact on employee access. Construction activities will temporarily affect the marketability of development projects in the immediate vicinity of construction and the absorption of commercial, industrial and residential space in South Boston.

Development Impacts

The depression of the Central Artery will create about 20 acres of new developable land on air rights, which could accommodate approximately 2.75 million square feet of development and approximately 1 million square feet of parking. Based on preliminary urban design estimates of land use by office, commercial, and residential categories, construction costs for the full air rights development are estimated to total approximately $285 million (1983 dollars) and could generate 6,100 person-years of on-site construction employment. Total direct, indirect and induced impacts of these construction expenditures on the regional economy would include an estimated $960,000 in industry sales and household earnings and 10,800 person-years of employment. Long-term jobs attributable to the office, commercial, and residential land uses assumed for the air rights are estimated to total 9,400. These workers (and new residents) would be expected to generate an estimated $9 to $10 million annual retail sales within the project area.

Air Quality

These impacts are measured in terms of areawide emissions and air quality at certain key receptors. Pollutants reviewed include carbon monoxide (CO), nonmethane hydrocarbons (NMHC), and nitrogen oxides (NOx).

Areawide (Gross Emissions)

Planned federal emission controls on automobiles will result in long-term air quality improvements with either the No-Build or the Preferred Alternatives.

Generally, CO and NMHC emissions in 2010 for the Preferred Alternative will be slightly less than for the No-Build Alternative. Because of overall increases in travel speeds, however, NO_x emissions will increase slightly for the Preferred Alternative.

Pollutant Concentrations at Selected Receptors

One-hour CO concentrations with the Preferred Alternative will decrease at 31 out of 39 receptor locations and stay the same at 6 locations when compared with the No-Build. No violations of the one-hour CO standard established under the Clean Air Act occurred in 1982 at selected sensitive receptors in the project area. None are expected in 2010 whether the Preferred Alternative or the No-Build Alternative is chosen. Significant reductions in CO concentrations can be expected in Waterfront, North End and East Boston locations.

With the Preferred Alternative, eight-hour CO concentrations decrease at 30 out of 39 receptor locations and stay the same at 5 locations, and no violations are expected. Violations of EPA's eight-hour CO standards do exist today at several of the selected receptors, and those violations generally continue in year 2010 in the No-Build case. Emissions from ventilation buildings do not contribute significantly to either one-hour or eight-hour CO concentrations at any receptor locations.

Eight-hour CO concentrations and one-hour NO_2 concentrations at existing toll plazas can be expected to exceed applicable standards with the No-Build Alternative. The Preferred Alternative provides a dramatic reduction in queues at toll plazas, with the result that these air quality measures will be well below violation levels at both the existing and new toll plazas.

With respect to emissions from the ventilation buildings analyzed as part of this FEIS/FEIR, analysis shows one-hour NO_2 concentrations will exceed State policy level at certain surface street or roof locations near many of these ventilation buildings with the Preferred Alternative. The Commonwealth is committed to further air quality analysis which will result in the final selection of locations for ventilation buildings, possible modifications of vent stack heights, and other modifications to the tunnel's ventilation system to address the State's policy level on NO_2 concentrations.

Construction Period Impacts

Air quality may also be affected during some periods of construction at locations which presently are air quality "hot spots," such as Dewey Square, Broadway Station, Atlantic Avenue and the existing toll plazas for the Callahan/Sumner Tunnels in East Boston. (Air quality along local streets in East Boston is not expected to deteriorate.)

The No-Build Alternative during the redecking process would have similar effects on those locations in the Central Artery corridor.

Dust from construction activities may have adverse impacts near construction staging areas and along truck routes. Dust control measures will be implemented during construction to mitigate these impacts.

Noise

Noise levels will decrease by more than 5 decibels at five sensitive receptor locations with the Preferred Alternative, compared to No-Build Alternative noise levels in 2010. This is primarily due to the elimination of the elevated Central Artery as a source of noise. No significant changes in noise levels are expected at other sensitive receptor sites from those predicted for the No-Build Alternative in 2010.

During the construction of the

Preferred Alternative, minor to substantial impact from construction noise is expected at some sites as compared to existing noise levels. Mitigation measures will include, for example, the use of equipment mufflers, temporary noise barriers, and limiting the hours of noisy construction in the areas of noise sensitive sites.

Vibration

No adverse vibration impacts are anticipated from the Preferred Alternative. Moreover, benefits can be expected after the removal of the Central Artery viaduct.

During construction, minor architectural damage may occur at 26 residential buildings in the North End, 26 office or commercial buildings in the Central Area, 15 industrial buildings (2 in the North End, 5 in the South End, and 8 in northern South Boston) and at the Boston Garden. Mitigating measures and monitoring of construction work will be undertaken to minimize the risk of damage. Temporary annoyance is expected at several three-story residential buildings in Charlestown, some residential buildings in the North End, as well as at office or commercial buildings, industrial buildings, institutional buildings, hotels, and the Spaulding Rehabilitation Hospital. In all, about 2,600 people living in the project area would be disturbed by vibration during some portion of the construction period.

Water Quality

The Preferred Alternative will reduce pollutants in Boston Harbor, as vehicular pollutants which now wash off of the Central Artery viaduct would be contained in the enclosed tunnel. There will be no appreciable long-term impacts to the Charles River, as the two areas to be filled are out of the main channel and will not affect either the flow of water or water quality. (Design modifications now underway may eliminate all construction in the Charles River.)

Construction impacts are minor. Potential leakage of dredged sediment from barges and turbulence from tug boats and dewatering are the only potential impacts to water quality. The loss of organisms in the sediment or caught behind the steel sheet piling walls will not be significant to the overall ecosystem. The only long-term biological impact will result from the small loss of habitat area from the new structures. Impacts from dredging for sunken-tube construction of the Third Harbor Tunnel will include very minor releases of contaminants. Biologic impacts will include a loss of benthic fauna and fish, but recolonization of harbor sediments and new bulkheads will commence the following spring.

Navigation impacts will be minimized by careful coordination of dredging and tunnel construction with the U.S. Coast Guard, the Boston Harbormaster, and maritime interests. Currently navigable waters in Boston Harbor and the Fort Point Channel will remain navigable.

Wetlands

There are no Federally regulated wetlands in the project area. The Preferred Alternative will result in the conversion of approximately 9.1 acres of the South Bay area of the Fort Point Channel from open water to developed use. Construction of the northbound Central Artery tunnel and new Dorchester Avenue in the Fort Point Channel will result in the loss of approximately 9.5 percent of the open water. Approximately 1.18 acres along the southern banks of the Charles River between the old and new Charles River Dam and 0.5 acres in the tidal portion of the Charles River will also be converted to a developed use. (Design modifications now underway may eliminate use of land within the tidal portion of the Charles River.)

Floodplains

The Preferred Alternative will result in a small amount of floodplain encroachment within the Fort Point Channel and within the Charles River. These reductions in floodplain area will have a negligible effect in the Fort Point Channel, Charles River and Boston Harbor as a whole.

Vegetation and Wildlife

Potential impacts to vegetation and wildlife will be negligible. Small quantities of lands of very limited wildlife habitat potential will be affected. No endangered or threatened species listed at either the Federal or State levels are known to occur in the project area.

Dredged and Excavated Material

Construction of the Preferred Alternative will generate approximately 1,010,000 cubic yards of rock, clay and organic dredged material. Bioassay and bioaccumulation analyses indicate that these materials should be acceptable for ocean disposal under current regulations. The Massachusetts Bay Foul Area is suitable for ocean disposal of dredge material.

The depression of the Central Artery, and the construction of that portion of the Third Harbor Tunnel in land areas of East Boston and South Boston will require disposal of an additional 6.2 million cubic yards of excavated material.

Historic Impacts

Long-Term

There will be significant beneficial effects for the entire Boston region through the removal of the Central Artery viaduct and the rejoining of the downtown with Boston's historic North End and Waterfront areas.

There will be adverse effects as well, including the taking of certain buildings which are neither on the National Register of Historic Places nor eligible for inclusion in the Register, but which are located in an area potentially eligible for designation as a National Register Historic District. These include the Charles River Building at 131 Beverly Street, and the loading dock of the Stop & Shop Bakery Building on Causeway Street, both in the Causeway/North Washington Streets District (design modification work now underway suggests that a ramp redesign in the area may obviate the need to take this building and/or the loading dock). Approximately 0.9 acres of the total 6.7 acre district will be affected.

The Preferred Alternative will have impacts on the potentially eligible National Register District in the Fort Point Channel area. Impacts include slight reduction of the width of the Channel and the removal of part of the historic bulkhead. The South Bay will be filled to a new bulkhead line near the existing Dorchester Avenue Bridge due to the construction of the Seaport Access tunnel across the southernmost portion of the Fort Point Channel. Approximately 9.5 percent (or 10.3 acres) of the Fort Point Channel water area will be affected. The historic Old Colony Railroad Bridge will be removed. The Section 106 Memorandum of Agreement requires the restoration of the historic character of the Fort Point Channel through the use of granite facing in constructing the new portion of the bulkhead and landscaping improvements along the Boston side of the Channel.

Construction Period

During construction, the increased congestion from traffic reroutings, noise and dust, and vibration impacts will occur in historic districts adjacent to the project area. These impacts will be mitigated to avoid damage to historic properties.

Utilities

Utilities in the project area,

which include water, storm drains, sanitary sewers, combined sewers, gas, electric, communications, etc., will be either temporarily supported or permanently relocated as part of the proposed project. Utility services are not expected to be severely interrupted, although slight disruptions may occur when the connections from the old to the new utility occurs.

Visual Impacts

Visual impacts of the depression and widening of the Central Artery are expected to be positive. The removal of the viaduct will reopen views to Boston's waterfront and permit new access to light and air throughout the Artery corridor. New development will be planned appropriately in conjunction with community residents, public agencies and other interested groups. This development can reconnect the Waterfront and the downtown and complement the cityscape of the surrounding areas.

Several new ramps and ventilation buildings will introduce new highway elements into the urban environment along the Artery corridor.

Visual impacts in the Fort Point Channel due to a slight reduction of the Channel's water surface and the loss of the continuous bulkhead line will be mitigated by provisions in the Section 106 Memorandum of Agreement such as those listed above. The Preferred Alternative will increase pedestrian accessibility to the Channel.

Significant adverse aesthetic impacts will occur in the South Bay area, with the addition of a new ramp system much taller than the surrounding structures.

The visual quality of the lower Charles River Basin in the North Station area will be adversely affected by lower bridges, additional ramps and a ventilation building. These roadway elements will adversely affect views and the pedestrian environment across and along the banks of the Charles River.

Mitigation of many of the adverse visual impacts will occur through appropriate design measures and incorporation of structures into other developments.

Energy

The Preferred Alternative will cause energy consumption to increase slightly, by approximately 1.4 percent, when compared to the No-Build Alternative. Total energy consumption includes vehicle operations, as well as facility construction, maintenance and operations.

Section 4(f)

Federal transportation law (in a provision known as "Section 4(f)") prohibits the use of land from a publicly-owned park, recreation area or wildlife or waterfowl refuge or from a significant historic site (whether publicly or privately owned) unless the U.S. Department of Transportation determines (1) that there are no feasible and prudent alternatives to the use of the land; and (2) that any use is accompanied by all possible planning to minimize harm to the property resulting from the use.

The Preferred Alternative requires the permanent use of about 500 square feet of the 17,000 acre Charles River Basin Reservation, at a point near the intersection of the Msgr. O'Brien Highway and Storrow Drive at Leverett Circle. This land is currently used for parking by the MDC police. Temporary construction easements for limited additional portions of the Reservation will be required; affected areas would be restored to their original condition following completion of construction.

At Paul Revere Landing Park some 40,000 square feet of land located under or adjacent to the High-Level Bridge over the Charles River will be permanently taken. This

land is currently used for parking and pedestrian access to the park, an 8.5 acre facility within the Charles River Basin Reservation. The MDC Access Road, pedestrian walk and bulkhead will be realigned, and the parking area will be reconfigured.

The Preferred Alternative avoids permanent takings of any surface land in the East Boston Memorial Stadium and will make 3 acres of land available for addition to the stadium. Improvements in the air quality in the immediate vicinity of the stadium will also result from the project. Up to 34,000 square feet of land along the eastern edge of the park, including the tennis courts, may be disrupted during construction. A temporary construction easement will be required, and affected areas will be returned to their original condition.

In addition, the Preferred Alternative will affect the historic districts in the Fort Point Channel and Causeway/North Washington Street areas; those impacts, including takings, were outlined previously under Historic Impacts in this SUMMARY.

E. ISSUES/AREAS OF CONTROVERSY

Issues and areas of controversy identified during the course of the study, including those raised by agencies and the public, are listed below. FEIS/FEIR sections where the issues are addressed are identified in parentheses ( ).

o Consideration of improvements to mass transportation facilities as alternatives to a Third Harbor Tunnel and an improved Central Artery (1.3, 2.4, 4.2)

o Induced traffic potential of a Third Harbor Tunnel and depressed Central Artery (1.3, 4.2).

o Intrusions of regional highway traffic into South Boston, South End, North End and East Boston neighborhoods (1.3, 3.1, 4.2).

o Sensitivity of Red Line, Orange Line and Blue Line Tunnels to Third Harbor Tunnel and Central Artery construction vibration (2.3, 4.8).

o Final locations of ventilation buildings (2.1, 4.4, 4.5, 4.7, 4.16).

o Locations of Central Artery ramps (2.1, 2.3, 4.2, 4.4, 4.5, 4.16).

o Sensitivity of the Gillette Company facilities and operations to Third Harbor Tunnel construction vibration and reduction of Fort Point Channel industrial cooling capacity (2.3, 4.8, 4.9).

o Proposed dredging program and impacts to water quality (turbidity) and aquatic life (4.9, 4.12, 4.13).

o Third Harbor Tunnel and Central Artery effects on quality/use of Fort Point Channel (4.4, 4.14, 4.16, 5.2).

o Impacts on private and public parking (4.2, 4.3, 4.4, 4.5).

o Rodent control and stabilization of the water table during construction (4.1).

F. SIGNIFICANT UNRESOLVED ISSUES

The following issues are unresolvable until the project enters subsequent phases of project development. FEIS/FEIR sections where the issues are addressed are identified in parentheses ( ).

o The extent of federal-aid construction funding for specific project components of the Preferred Alternative (6.1, 6.2).

o Selection of the materials for sunken tube tunnel construction: concrete or steel (4.1).

o Selection of tunnel fabrication site, including additional analysis as needed (4.1).

o Selection of site(s) for replacement parking (4.2, 4.4).

o Identification of disposal sites for excavated and dredged materials (4.13).

o Design of the new bridges and ramps across the Charles River, and analysis of their effects on Charles River Reservation, including existing and proposed MDC park facilities, navigation, traffic on Storrow Drive, BRA North Station plans, etc. (1.4, 4.2, 4.4, 4.9, 4.10, 4.11, 4.14, 4.16, 5.1, 5.2).

o Approvals of all required Federal, State, and local permits necessary for project to proceed (no specific section).

o Identification of appropriate staging areas for construction (4.1).

o The establishment of process to assure environmentally-sensitive future joint development activity with full citizen and agency participation (4.4).

o Construction impacts on traffic, air quality and noise levels in the project area (4.2, 4.7, 4.8).

o Location and height of ventilation buildings (4.4, 4.5, 4.7, 4.14, 4.16).

o The extent of work for the Phase I, Step 2/Phase II Archaeological Survey and final mitigation details for impacts on archaeological resources, consistent with the Section 106 Memorandum of Agreement (4.14, 5.3).

o Construction staging and sequencing of the project (4.1).

o Further study of business relocation impacts, including a case by case analysis of whether specific private facilities will be taken or modified (4.3).

G. OTHER FEDERAL ACTIONS REQUIRED FOR IMPLEMENTATION OF PROPOSED ACTION

o Section 10 Permit (construction and dredging in navigable waters -- Boston Harbor) - U.S. Army Corps of Engineers.

o Section 103 Permit (Marine Protection, Research and Sanctuaries Act) for ocean disposal of dredged material - U.S. Army Corps of Engineers.

o The Section 106 (National Historic Preservation Act of 1966) Review will be completed.

o Section 404 Permit (dredge spoils disposal) - U.S. Army Corps of Engineers.

o Section 401 Water Quality Certification (U.S. Clean Water Act) - Administered by the Massachusetts Department of Environmental Quality Engineering, Division of Water Pollution Control.

o Federal Aviation Regulations, Parts 77, 151, 152 - Federal Aviation Administration.

o Construction agreements for railroad relocation - Amtrak and Conrail.

o U.S. Coast Guard permits for new bridges over navigable waters.

o U.S. Coast Guard permit for alterations of existing bridges.

o U.S. Coast Guard approval for work in Boston Harbor.

SUMMARY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVES

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
TRANSPORTATION										
2010 Traffic Diversions relative to Alt. 1 (AWDT)	# %	# %	# %	# %	# %	# %	# %	# %	# %	# %
° Callahan/Sumner Tunnels	0	-33,200 (-36)	-32,200 (-35)	-32,600 (-36)	-33,400 (-36)	-31,200 (-34)	-33,100 (-36)	+ 3,300 (+ 4)	-30,400 (-33)	-14,500 (-16)
° Mystic-Tobin Bridge	0	-25,600 (-32)	-23,700 (-30)	-16,400 (-21)	-25,200 (-32)	-23,600 (-30)	-15,900 (-20)	+ 1,800 (+ 2)	-15,400 (-19)	- 8,600 (-11)
° Central Artery North of Callahan/Sumner Tunnels	0	- 1,300 (- 1)	+ 2,800 (+ 2)	+ 4,700 (+ 3)	+ 400 (0)	+ 400 (0)	+ 8,700 (+ 5)	+ 4,200 (+ 2)	+12,200 (+ 7)	+ 3,100 (+ 2)
° Central Artery South of Callahan/Sumner Tunnels	0	-29,900 (-17)	-28,800 (-17)	- 1,300 (- 1)	-27,400 (-16)	-27,200 (-16)	+ 7,400 (+ 4)	+40,100 (+23)	+12,900 (+ 7)	+23,800 (+14)
° Mass. Turnpike Extension	0	+13,200 (+17)	+12,800 (+16)	+12,400 (+16)	+16,200 (+20)	+15,600 (+20)	+17,400 (+22)	+ 5,200 (+ 7)	+23,000 (+29)	+16,900 (+21)
° Route 1A, North of Bennington Street	0	+ 7,600 (+19)	+ 8,600 (+22)	+ 2,200 (+ 6)	+ 7,200 (+18)	+ 8,800 (+22)	+ 400 (+ 1)	- 100 (0)	+ 5,600 (+14)	+ 1,500 (+ 4)
2010 PM Level of Service (# Locations)										
Existing Highway Sections										
° A-D	19 (35)	21 (48)	19 (44)	20 (54)	25 (49)	21 (42)	21 (57)	18 (47)	20 (56)	20 (52)
° E	4 (8)	6 (13)	6 (14)	6 (16)	5 (10)	8 (16)	4 (11)	3 (8)	8 (22)	5 (13)
° F	31 (57)	17 (39)	18 (42)	11 (30)	21 (41)	21 (42)	12 (32)	17 (45)	8 (22)	14 (35)
TOTAL	54 (100)	44 (100)	43 (100)	37 (100)	51 (100)	50 (100)	37 (100)	38 (100)	36 (100)	39 (100)
South Boston Intersections										
° A-D	7 (47)	8 (53)	8 (53)	6 (40)	9 (60)	9 (60)	7 (41)	6 (40)	12 (60)	9 (47)
° E	2 (13)	1 (7)	1 (7)	2 (13)	0 (0)	0 (0)	2 (12)	1 (7)	2 (10)	2 (11)
° F	6 (40)	6 (40)	6 (40)	7 (47)	6 (40)	6 (40)	8 (47)	8 (53)	6 (30)	8 (42)
TOTAL	15 (100)	15 (100)	15 (100)	15 (100)	15 (100)	15 (100)	17 (100)	15 (100)	20 (100)	19 (100)
East Boston/Revere Intersections										
° A-D	10 (63)	13 (81)	13 (81)	13 (81)	13 (81)	13 (81)	13 (81)	10 (65)	14 (78)	12 (76)
° E	2 (12)	1 (6)	1 (6)	1 (6)	1 (6)	1 (6)	1 (6)	3 (18)	1 (6)	2 (12)
° F	4 (25)	2 (13)	2 (13)	2 (13)	2 (13)	2 (13)	2 (13)	3 (17)	3 (16)	2 (12)
TOTAL	16 (100)	16 (100)	16 (100)	16 (100)	16 (100)	16 (100)	16 (100)	16 (100)	18 (100)	16 (100)
Downtown Boston Intersections										
° A-D	5 (25)	4 (40)	11 (52)	11 (42)	4 (36)	11 (50)	12 (48)	12 (48)	17 (68)	12 (48)
° E	4 (20)	0 (0)	1 (5)	3 (12)	2 (18)	4 (18)	3 (12)	4 (13)	1 (1)	2 (8)
° F	11 (55)	6 (60)	9 (43)	12 (46)	5 (46)	7 (32)	10 (40)	10 (39)	7 (28)	11 (44)
TOTAL	20 (100)	10 (100)	21 (100)	26 (100)	11 (100)	22 (100)	25 (100)	26 (100)	25 (100)	25 (100)
Project Roadways and Approaches										
° A-D	NOT AVAILABLE	20 (67)	23 (70)	21 (53)	20 (80)	27 (93)	34 (68)	7 (28)	46 (77)	30 (61)
° E		4 (13)	2 (6)	6 (15)	5 (20)	0 (0)	4 (8)	2 (8)	9 (15)	7 (14)
° F		6 (20)	8 (24)	13 (32)	0 (0)	2 (7)	12 (24)	16 (64)	5 (8)	12 (25)
TOTAL		30 (100)	33 (100)	40 (100)	25 (100)	29 (100)	50 (100)	25 (100)	60 (100)	49 (100)

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2 Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
TRANSPORTATION (continued)										
# Hours Callahan/Sumner Tunnels @ Level of service E or F each Weekday: 2010	14	1	1	0	1	1	1	14	1	5
# Hours Central Artery N. of Tunnels @ Level of Service E or F each Weekday: 2010 (Average of Northbound and Southbound)	10	Not Available	8	0	not available	7	3	0	2	3
# Hours Central Artery S of Tunnels @ Level of Service E or F each Weekday: 2010 (Average of Northbound and Southbound)	13	Not Available	10	0	not available	5	3	8	2	5
Construction Traffic Impacts (Affected Area)	High-Level Bridge Ramp Access Surface Artery	Central Artery Financial District North End Ft. Pt. Channels Bridges So. Boston - Andrew Square B'way/Dorch. Ave. So. End - Herald/Albany	Central Artery Financial District North End Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. So. End - Herald/Albany Logan Airport Roads	Central Artery Surface Artery Financial District North End Haymarket West End Government Center Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. Logan Airport Roads	Central Artery Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. So. End - Herald/Albany	Central Artery Surface Artery Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. So. End - Herald/Albany Logan Airport Roads	Central Artery Surface Artery Financial District North End Haymarket West End Government Center Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. Northern Ind'l Area Logan Airport Roads	Central Artery Surface Artery Financial District North End Haymarket West End Government Center Ft. Pt. Channel Bridges So. Boston - Andrew Square B'wav/Dorch. Ave.	Central Artery Surface Artery Financial District North End Haymarket West End Government Center Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. Northern Ind'l. Area Logan Airport Roads Bird Island Flats	Central Artery Surface Artery Financial District North End Haymarket West End Government Center Ft. Pt. Channel Bridges So. Boston - Andrew Square B'way/Dorch. Ave. Northern Ind'l. Area Logan Airport Roads Bird Island Flats
VMT diff. rel. to Alt. 1	—	+19.9 million	+20.8 million	+32.3 million	+18.6 million	+27.3 million	+36.0 million	+15.0 million	+17.7 million	+68.6 million
PHT diff. rel. to Alt. 1	—	- 6.5 million	- 8.2 million	- 8.8 million	- 7.9 million	- 9.2 million	-13.0 million	- 1.8 million	-17.6 million	-10.3 million
2010 Yearly Accident Reduction: Selected Locations (% change vs. Alt. 1)	(Base Case)	-11%	-19%	-26%	-12%	-17%	24%	-12%	-25%	-23%

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
BUSINESS DISPLACEMENTS/RELOCATIONS										
Boston: # Businesses	0*	2*	2*	86	0*	0*	89	9	97	97
# Employees	0	75	75	3,632	0	0	2,987	2,880	3,370	3,370
East Boston: # Businesses	0	14	22	22	14	22	22	0	34	16
# Employees	0	160	435	435	170	435	435	0	1,030	304
Total: # Businesses	0	16	24	108	14	22	111	89	131	113
# Employees(approx.)	0	245	510	4,570	170	435	3,420	2,880	4,400	3,675
LAND USE										
Beneficial to Existing Land Use (by area)	None	Some Ft. Pt Channel Sites Logan Airport	Some Ft. Pt. Channel Sites Logan Airport	Some Ft. Pt. Channel Sites Financial District Waterfront North End Some N. Station Sites Logan Airport	Some Ft. Pt. Channel Sites Logan Airport	Some Ft. Pt. Channel Sites Logan Airport	Some Ft. Pt. Channel Sites Financial District Waterfront North End Some N. Station Sites South Boston Industrial Area	Some Ft. Pt. Channel Sites Financial District Waterfront North End Some N. Station Sites	Some Ft. Pt. Channel Sites Chinatown Financial District Waterfront North End East Boston Logan Airport Some N. Station Sites South Boston Industrial Area	Some Ft. Pt. Channel Sites Financial District Waterfront North End Logan Airport Some N. Station Sites South Boston Industrial Area
Adverse Effects on Existing Land Use (by area)	None	East Boston Some Ft. Pt. Channel Sites	Some Ft. Pt. Channel Sites	Some Ft. Pt. Channel Sites Some N. Station Sites	East Boston Some Ft. Pt. Channel Sites	Some Ft. Pt. Channel Sites	Some N. Station Sites Some S. Boston Sites	Some Ft. Pt. Channel Sites Some N. Station Sites	Some N. Station Sites Some S. Boston Sites	Some N. Station Sites Some S. Boston Sites

* These do not include the 9 parking lots and the 30 employees temporarily displaced under the existing Central Artery.

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
NEIGHBORHOOD AND COMMUNITY FACILITIES IMPACTS										
Construction Period Neighborhood Disruption (by area)	Moderate Financial, Waterfront North End, Government Center, North Station	East Boston South Boston	South Boston	South Boston Waterfront Government Center North End North Station West End	East Boston South Boston	South Boston	South Boston Waterfront Government Center North End North Station West End	South Boston Waterfront Government Center North End North Station West End	South Boston Waterfront Government Center North End North Station West End	South Boston Waterfront Government Center North End North Station West End
Long-term Improvement in Neighborhood Quality of Life (by area)	None	Chinatown North End	Chinatown North End East Boston	Chinatown Waterfront Government Center North End (possible) East Boston	Chinatown North End	Chinatown North End East Boston	South Boston Chinatown Waterfront Government Center North End (possible) East Boston	Chinatown Waterfront Government Center North End (possible)	South Boston Chinatown Waterfront Government Center North End (possible) East Boston	South Boston Chinatown Waterfront Government Center North End (possible)
Long-term Reduction in Neighborhood Cohesion (by area)	Some	East Boston	None	North End (possible)	East Boston	None	North End (possible)	North End (possible)	North End (possible)	North End (possible)

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
ECONOMICS										
Project Cost ($ Million)										
Construction	33	730	919	1,797	731	915	2,097	1,251	2,424	1,962
Right-of-Way	0	19	26	98	4	12	90	63	140	104
Total	33	749	945	1,895	735	927	2,187	1,314	2,564	2,066
Construction Employment (person-years)										
On-site (Boston residents in parentheses)	697	4,800 (1,150)	5,100 (1,220)	39,378 (9,845)	4,100 (980)	5,100 (1,220)	45,815 (11,450)	27,360 (6,840)	55,794(13,950)	44,332 (11,083)
Off-site	407	16,000 (690)	17,000	15,077	13,200 (510)	16,500	17,542	10,476	21,206	16,974
Total	1,104	20,800	22,100	54,455	17,300	21,600	63,357	37,836	77,000	61,306
Construction-period tax losses to City of Boston from takings (per year)	None	Not Available	$125,000	$750,000	Not Available	$70,000	$900,000	$750,000	$1,090,000	$1,090,000
Construction-period tax loss to City of Boston due to development delays (per year)	None	None	None	$5-10 million	None	None	$5-10 million	$5-10 million	$5-10 million	$5-10 million
Long-term annual tax increases over No-Build due to new development air-rights City of Boston	Base Case	$800,000	$800,000	$5-10 million	$800,000	$800,000	$5-10 million	$5-10 million	$5-10 million	$5-10 million
One-time (non-annual) receipt due to faster absorption rate of space in new South Boston development	0	N/A	N/A	$ 2-5 million	N/A	N/A	$20-30 million	$1-3 million	$20-30 million	$20-30 million

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
AIR QUALITY (year 2010)										
Violations of 8-hr. CO Standards (# locations)	4	0	0	0	0	0	0	1	0	0
Toll Plaza Contributions - 8-hr. CO (parts per million)										
Bremen at Gove	4.7	0.2	< 0.2	< 0.2	0.2	< 0.2	< 0.2	3.7	< 0.2	1.3
Porzio Park	1.1	< 0.2	0.4	0.5	< 0.2	0.4	0.5	0.9	< 0.2	0.3
Near Sumner Toll	8.0	0.3	0.3	0.2	0.3	0.3	0.2	6.3	< 0.2	2.3
Toll Plaza Contribution - 1-hr. NO_2 (ug/m³)										
Bremen at Gove	359	22	12	10	22	12	10	284	< 10	101
Porzio Park	56	< 10	22	24	< 10	22	24	45	< 10	16
Near Sumner Toll	486	19	13	11	19	13	11	384	< 10	137

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
NOISE										
Short-term/Construction Noise: Substantial Impacts (15 dBA or greater)	1 Resid. St.	1 Public Bldg. 1 Resid. St.	1 Public Bldg.	1 Hospital 1 Resid. St. 1 Museum	1 Public Bldg. 1 Resid. St.	1 Public Bldg.	1 Hospital 1 Resid. St. 1 Museum	1 Hospital 1 Resid. St. 1 Museum	1 Hospital 1 Resid. St. 1 Museum 1 Playground	1 Hospital 1 Resid. St. 1 Museum
Change in Total Noise Level (without noise abatement) 2010 # Sensitive Receptors	Base Case	3 sites minor impact (5-10 dBA)	1 Site minor impact (5-10 dBA)	5 Sites decreased noise	2 Sites minor impact (5-10 dBA)	no impact	4 Sites decreased noise	1 Site minor impact (5-10 dBA) 5 Sites decreased noise	5 Sites decreased noise	5 Sites decreased noise
VIBRATION										
Short-term/Construction Impacts										
° Vibration Annoyance (# residents)	Not Significant	3100	460	2,800	3,030	390	2,840	2,560	2,600	2,600
° Structural Damage Potential (# buildings)	none	1	1	3	0	0	3	3	3	3
Vibration Impacts, 2010	none	none	none	none	none	none	none	none	none	none

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
WATER										
Wetlands (Federal)	none	none	none	none	none	none	none	none	none	none
Floodplains	none	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant
Water Resources (# days of dredging work in Boston Harbor)	none	170	250	250	170	250	210	none	46	30
WILDLIFE/VEGETATION Impacts on sensitive habitats or endangered species	none	none	none	none	none	none	none	none	none	none
UTILITIES IMPACTS	none	moderate relocation	moderate relocation	major relocation	moderate relocation	moderate relocation	major relocation	major relocation	major relocation	major relocation
ENERGY IMPACTS	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant
VISUAL	none	Beneficial: none Adverse: E. Boston Ft. Pt. Channel	Beneficial: none Adverse: Ft. Pt. Channel	Beneficial: N. End Waterfront Financial Dist. Adverse: N. Station/ Charles R. Ft. Pt. Channel	Beneficial: none Adverse: E. Boston Ft. Pt. Channel	Beneficial: none Adverse: Ft. Pt. Channel	Beneficial: N. End Waterfront Financial Dist. Adverse: N. Station/ Charles R.	Beneficial: N. End Waterfront Financial Dist. Adverse: N. Station/ Charles R.	Beneficial: N. End Waterfront Financial Dist. Adverse: N. Station/ Charles R. S. Bay	Beneficial: N. End Waterfront Financial Dist. Adverse: N. Station/ Charles R. S. Bay

SUMMARY OF ENVIRONMENTAL IMPACTS

OF ALTERNATIVES (Cont.)

IMPACT	1 No-Build	2 Tunnel: Split/RR	3 Tunnel: Split/Airp.	3A Tunnel & Depressed Artery	4 Tunnel: 2-Way/RR	5 Tunnel: 2-Way/Airp.	5A South Boston Tunnel & Depressed Artery	6 Depressed Artery	Preferred Alternative South Boston Tunnels & Depressed Artery With Modifications (Alt. 5A Modified)	Two-Lane Tunnel Concept Incl. Depressed Artery
CULTURAL										
Historic (National Register) Districts										
Construction - Period Adverse Effects	Fulton Com. St. Dist. Blackstone Block Dist. Bulfinch Triangle Dist. Church Green Dist. N. End Dist. Old Waterfront Dist. Causeway/N. Wash. Dist.	Ft. Pt. Channel	Ft. Pt. Channel	Fulton Com. St. Dist. Blackstone Block Dist. Charles R. Basin Dist. Church Green Dist. Custom House Dist. N. End Dist. Old Waterfront Dist. Causeway/N. Wash. Dist. Ft. Pt. Channel (severe)	Ft. Pt. Channel	Ft. Pt. Channel	Blackstone Block Dist. Bulfinch Triangle Dist. Charles R. Basin Dist. Church Green Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Old Waterfront Dist. Ft. Pt. Channel S. Boston Piers Dist.	Blackstone Block Dist. Bulfinch Triangle Dist. Charles R. Basin Dist. Church Green Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Causeway/N. Wash. Dist. Old Waterfront Dist.	Blackstone Block Dist. Bulfinch Triangle Dist. Charles R. Basin Dist. Cornhill Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Causeway/N. Wash. Dist. Old Waterfront Dist. Ft. Pt. Channel Dist.	Blackstone Block Dist. Bulfinch Triangle Dist. Charles R. Basin Dist. Cornhill Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Causeway/N. Wash. Dist. Old Waterfront Dist. Ft. Pt. Channel Dist.
Long-term Effects	None	Ft. Pt. Channel (adverse)	Ft. Pt. Channel (adverse) Custom House Dist. (beneficial)	Beneficial: Blackstone Dist. Church Green Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Old Waterfront Dist. Adverse: Bulfinch Tri. Dist. Causeway/N. Wash. Dist. Ft. Pt. Channel (severe)	Ft. Pt. Channel (adverse)	Ft. Pt. Channel (adverse)	Beneficial: Blackstone Dist. Church Green Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Old Waterfront Dist. Adverse: Bulfinch Tri. Dist. Causeway/N. Wash. Dist. Ft. Pt. Channel	Beneficial: Blackstone Dist. Church Green Dist. Custom House Dist. Fulton Com. Dist. N. End Dist. Old Waterfront Dist. Adverse: Bulfinch Tri. Dist. Causeway/N. Wash. Dist.	Beneficial: Blackstone Dist. Bulfinch Triangle Dist. Custom House Dist. N. End Dist. Old Waterfront Dist. Fulton Com. Dist. Adverse: Causeway/N. Wash. Dist. Ft. Pt. Channel	Beneficial: Blackstone Dist. Bulfinch Triangle Dist. Custom House Dist. N. End Dist. Old Waterfront Dist. Fulton Com. Dist. Adverse: Causeway/N. Wash. Dist. Ft. Pt. Channel
Parklands	None	E. Bos. Mem. Stadium BIF Park (proposed)	E. Bos. Mem. Stadium BIF Park (proposed)	E. Bos. Mem. Stadium BIF Park (proposed) Charles R. Basin Reservation Park Revere Landing Park	E. Bos. Mem. Stadium BIF Park (proposed)	E. Bos. Mem. Stadium BIF Park (proposed)	E. Bos. Mem. Stadium BIF Park (proposed) Charles R. Basin Reservation Park Revere Landing Park	Charles R. Basin Reservation Park Revere Landing Park	E. Bos. Mem. Stadium Charles R. Basin Reservation Paul Revere Landing Park	Charles R. Basin Reservation Paul Revere Landing Park

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1.0 INTRODUCTION

1.1 PURPOSE AND NEED FOR ACTION

The proposed action, as described in detail in Section 2.2 and in Figure 3, consists of the following:

(1) Construction of a widened and depressed Central Artery (I-93), from the Third Harbor Tunnel/Massachusetts Turnpike interchange to the Charles River/City Square area of Charlestown.

(2) Construction of a four-lane Third Harbor Tunnel (I-90) from the Southeast Expressway and present terminus of the Massachusetts Turnpike Extension (I-90) at the Central Artery (I-93) in Boston, to Logan Airport and Route 1A in East Boston via the industrial area of South Boston and Boston Harbor.

The need for the proposed action stems from the inability of the existing Central Artery and cross-harbor tunnels to accommodate both current and future traffic demands imposed on these regional facilities. These facilities, all constructed more than 25 years ago, were designed to handle projected traffic volumes that were approximately one half the present level. Three major improvements are addressed by the project: increased north-south highway capacity; increased cross-harbor highway capacity; and improved access to the developing South Boston seaport area.

The Central Artery was built in the early 1950s to serve as a "collector-distributor" roadway whose design reflected the requirements of locally-oriented service, with many closely spaced on- and off-ramps. Given the design standards and service requirements of its day, the road was considered adequate for its local service function, providing access to and from the Central Business District. Over the past 30 years, the Central Artery has become part of a regional expressway system - specifically Interstate Route 93 - serving users both north and south of Boston. The Artery serves a distinctly regional function in the transportation system, while accommodating multiple traffic movements within a short distance which is considered inconsistent with modern Interstate design standards. Beyond the issue of design standards is the issue of present and projected traffic volumes in relation to capacity. While designed with the expectation of serving 75,000 vehicles per day, the facility now serves over 165,000 vehicles per day.

The Central Artery is the most significant bottleneck in the regional highway system, causing millions of hours a year of user delay. It operates at or above capacity (i.e., traffic demand volumes equal or exceed the capacity of the roadway, resulting in congested operations) for up to eight hours a day. Congested conditions are due to several factors, including inadequate width; too many on- and off-ramps within a short distance creating weaving conditions and vehicle conflicts; and inadequate acceleration and deceleration lanes, which further add to vehicle conflicts. The major source of significant queuing and delay during peak hours is the Charlestown High-Level Bridge. Because of congestion, motorists use alternative routes via local streets in South Boston and the South End to bypass traffic jams. Traffic congestion and queues also result in numerous accidents, and air and noise pollution.

Today the Sumner and Callahan Tunnels operate at or above their capacity for five hours in the afternoon (1-6 PM) each weekday. The resulting congestion causes considerable delays and queuing at both the Boston and East Boston approaches to the tunnels, hampers the passage of emergency (fire, police, ambulance) vehicles across the Harbor, causes

backups on the Central Artery, and encourages through traffic to attempt to short-cut the congestion on the expressway ramps to the tunnels by using local residential streets in East Boston. The Mystic-Tobin Bridge operates reasonably free of congestion, but cannot relieve the Callahan/Sumner Tunnels problem because of the congested conditions of the Central Artery, particularly at the Charles River crossing.

Traffic congestion on the Central Artery and the cross-harbor facilities, especially during peak commuter periods, attests to the need for significant highway transportation improvements.

Traffic volumes (demand) on the regional highway network are projected to increase significantly by the year 2010 (design year), as a result of both regional and local development. Traffic on the Central Artery will increase by up to 10 percent, to approximately 175,000 vehicles on an average weekday. Traffic crossing Boston Harbor and the Mystic River will also increase by approximately 10 percent between 1982 and 2010 with the No-Build Alternative, to 170,000 vehicles on an average weekday. Traffic congestion and queuing will increase significantly on the Central Artery, the Mystic-Tobin Bridge, and in both existing tunnels. For the Callahan/Sumner Tunnels in particular, at-capacity or forced-flow conditions and resulting delays, queues, and backups onto the Central Artery will increase from five hours each commuting weekday in 1982 to 14 hours a day (generally from 6 AM to 8 PM) in 2010. On the Central Artery itself, traffic congestion and queuing will increase from up to 8 hours per day in 1982 to up to 13 hours per day in 2010. Congestion on these facilities will reach intolerable levels for travelers, residents, and businesses on both sides of the Harbor, further reinforcing the need for improvements in Central Artery and cross-harbor circulation and capacity to reduce such congestion.

The purposes of widening and depressing the Central Artery are to:

- eliminate the Charlestown High-Level Bridge bottleneck;
- increase through capacity on the Central Artery;
- improve through traffic/local traffic mix; and
- result in safer operations on the ramp system.

Traffic congestion on the Artery will be reduced from up to 13 hours per day in 2010 with the No-Build Alternative to 2 hours per day with the Preferred Alternative. The project will also permit the development of a continuous surface arterial street system, and improve the expressway connections between Interstate Route 93 and the Sumner and Callahan Tunnels. Also, it will provide an opportunity to create approximately 20 acres of developable land above the highway facility.

The purpose of the proposed Third Harbor Tunnel is to complete Interstate Route 90 in Massachusetts, and to provide needed additional vehicular harbor crossing capacity in Boston; it will significantly increase vehicular harbor crossing capacity. The Third Harbor Tunnel, in addition to the existing harbor crossings -- the Callahan and Sumner Tunnels and the Mystic-Tobin Bridge -- will satisfy vehicular harbor crossing travel demands through the design year.

The Third Harbor Tunnel will have a beneficial rerouting, or diversionary effect on the existing Callahan/Sumner Tunnels, reducing potential year 2010 traffic on them by approximately 35 percent (from approximately 91,000 to approximately 60,000 vehicles per day). This 2010 traffic equals approximately 70 percent of the existing traffic of 83,000 vehicles per day in the two tunnels.

During the peak hours, the

roject will reduce existing tunnel raffic by approximately 40 percent. he 14 hours of at-or above-capacity, ongested operation anticipated daily nder No-Build conditions in 2010 will e reduced to 1 to 2 hours each day if four-lane Third Harbor Tunnel is onstructed.

The proposed action will also mprove access to the northern indus- rial area of South Boston. As escribed in the "Seaport Access ystem Study" completed in 1980 by the oston Redevelopment Authority and the assachusetts Port Authority, there is need to improve access to South oston's rapidly growing northern ndustrial area (generally north of 'irst Street) without increasing truck raffic in South Boston's southern esidential area. In 1979, approxi- ately 170,000 vehicle trips were made n an average weekday to and from outh Boston. Of these trips, 13,000 ere truck trips. According to that tudy, vehicle trips are expected to ncrease by 36 percent by the year 2000 to 231,000 vehicles per day, with ruck traffic accounting for nearly 7,000 of the increase. Truck traffic from this area of South Boston, therefore, is expected to grow by 54 percent by the year 2000. A substan- tial percentage of these trucks will carry hazardous cargoes, primarily fuel oils.

The proposed action provides a direct "Seaport Access" connection from the expressway system to this area of South Boston. A significant portion of all vehicles, especially truck traffic, will be removed from local residential streets in South Boston. The combination of a direct Seaport access route with a new Third Harbor Tunnel to the Airport and Route 1A and with improved traffic service on the Central Artery will provide opportunities to resolve through/local traffic conflicts in South Boston. In addition, exclusive bus ramps between the Third Harbor Tunnel, the Southeast Expressway, and the South Station Transportation Center in Boston will improve bus/transit service on the regional highway system and provide a direct transit link to the airline terminals at Logan Airport from South Station.

In summary, the proposed action will improve the flow of traffic on the Central Artery, on cross-harbor facilities, and on other regional highway facilities by increasing capacity on the Central Artery, increasing cross-harbor capacity, and providing improved connections and transit service between regional facilities and the local street system, the seaport area of South Boston, and Logan Airport.

1.2 GENERAL DESCRIPTION OF THE PROJECT AREA

The project area (see Figure 1) has been generally defined to include those areas which may be directly affected by the proposed Third Harbor Tunnel/Central Artery project. It includes most of the central area of Boston, and extends from the existing Fitzgerald, or "Southeast," Expressway northerly along the Central Artery to the City Square area in Charlestown, and across Boston Harbor through East Boston, to Bell Circle in Revere. Major features of the project area are the following:

Highways: The Southeast Expressway and Central Artery (Inter- state Route 93) run north/south, intersecting the Massachusetts Turn- pike (Interstate Route 90) south of downtown Boston. Interstate Route 93 continues north across the Charles River and interchanges with U.S Route 1, which diverges towards the north- east, crossing the Mystic River on the Mystic-Tobin Bridge. Interstate Route 93 continues in a northerly direction through Somerville and beyond. The existing Callahan Tunnel (eastbound) and Sumner Tunnel (westbound) lie under Boston Harbor, and connect the Central Artery with the East Boston Expressway/State Route 1A, which continues northeast into Revere.

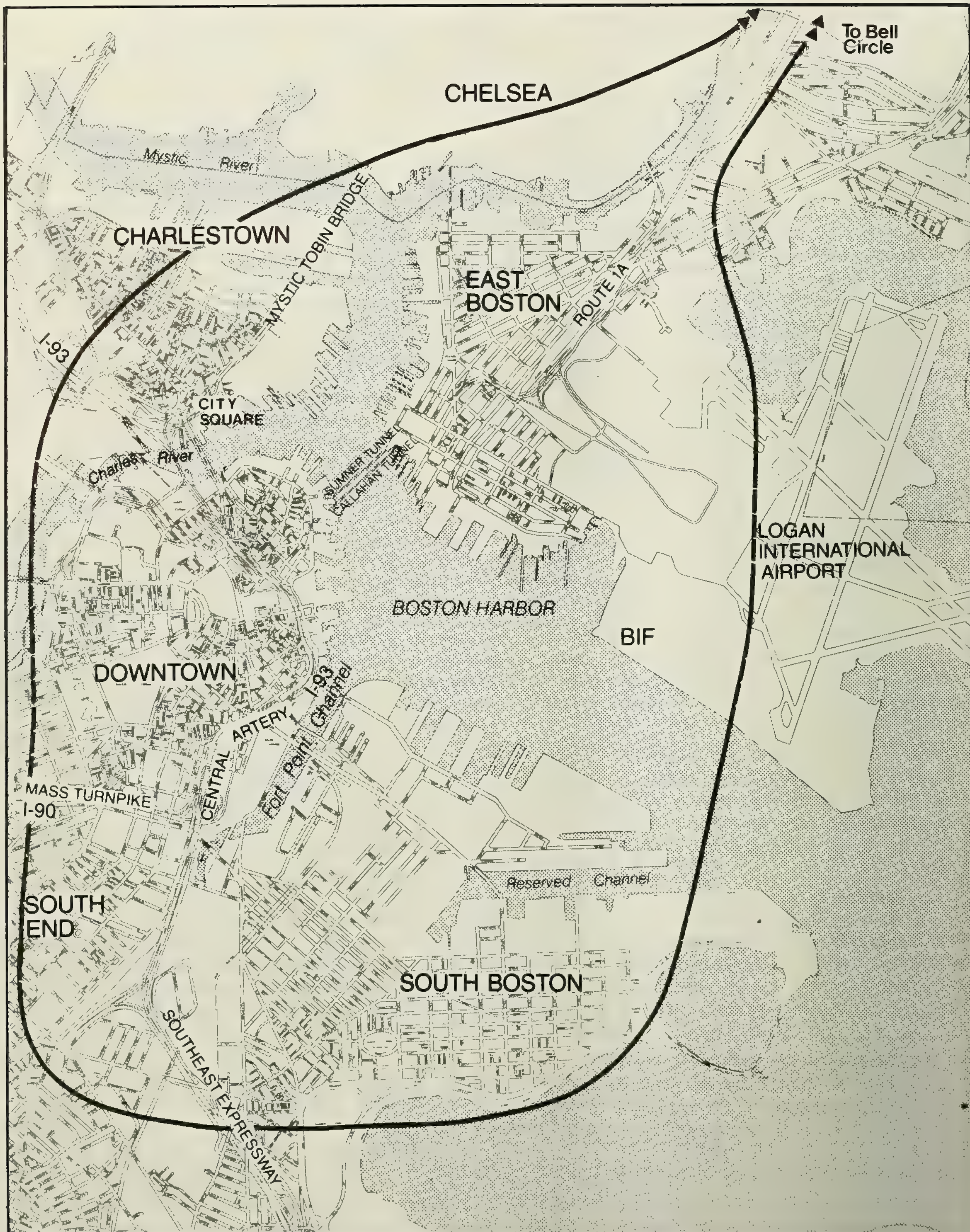


Figure 1
Project Area

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Other Transportation Nodes: outh Station is located near the nterchange of Interstate Route 90 and nterstate Route 93, in the Fort Point hannel area of Boston. It is a major ail terminus for Amtrak, Massachuetts Bay Transportation Authority MBTA) commuter rail, and intercity uses. MBTA rapid transit and bus ines criss-cross the area. Logan nternational Airport in East Boston as direct highway connections to the allahan/Sumner Tunnels. It is the 3th busiest passenger airport in the orld, and is the major air cargo erminal for southeastern New England.

Water Bodies: The Charles and ystic Rivers join to form Boston arbor, with its major shipping hannel serving the area's marine, ommercial, industrial, military, and leasure craft users. Fort Point hannel, which is approximately one ile long and of varying width (approx-mately 400 feet wide at its mid-oint), empties into Boston Harbor orth of the Northern Avenue Bridge. he Harbor and Channel are almost ntirely bordered by piers and bulk-eads.

Major Land Areas: On the Boston side of the harbor, the project area is situated in an industrial area between the residential neighborhoods of South Boston and the South End. South Boston is linked to the Southeast Expressway, the Central Artery, and Boston by a series of bridges over railroad land and the Fort Point Channel. The northern half of South Boston is industrial and contains several major port facilities.

The Boston side of Fort Point Channel includes Chinatown/South Cove, which is residential and institutional in character; the South Station and Leather District areas, which contain transportation, commercial, and industrial uses; the Boston Financial District; and the Waterfront, which is residential and commercial.

Proceeding northerly along the Central Artery, the project area includes the Government Center, North End, North Station, West End, and City Square/Charlestown subareas of Boston, which include significant residential, office, and commercial uses.

The project area on the East Boston side of the harbor includes a residential neighborhood, and industrial, railroad, and highway uses. The project area also includes part of Logan International Airport which occupies approximately 2,000 acres of land in East Boston.

1.3 MAJOR POLICY ISSUES

During the circulation of the DEIS/DEIR and the SDEIS/SDEIR, several major policy issues were raised by participants in the EIS process. This section of the FEIS/FEIR seeks to clarify both the policy context of the proposed action, and the consistency of the Preferred Alternative with those public policies. This section is organized into three categories: (1) Relationship Towards Regional Traffic; (2) Impact on Trip Making to Logan International Airport; and (3) Impact on Trip Making to Downtown Boston. Each of these subsections is organized to present the relevant policy of the Commonwealth; the conformance of the Preferred Alternative to that policy; and a discussion of those impacts associated with the project. Although not a major policy issue, a brief discussion of the traffic forecasting method and issues related to that method is also presented.

1.3.1 The Preferred Alternative and Regional Traffic

Policy

It is the policy of the Commonwealth's Executive Office of Transportation and Construction, consistent with Federal Environmental Protection Agency policy, to minimize total Vehicle Miles of Travel (VMT) in the Boston region and to discourage the use of neighborhood streets for regional vehicular traffic. The

Preferred Alternative has been examined in terms of its potential effect on increasing aggregate levels of vehicle travel. The Preferred Alternative has also been analyzed in terms of potential diversion from public transportation, diversion of through trips into the area, and the possible creation of newly induced trips. This section deals with overall impacts in these areas, while sections 1.3.2 and 1.3.3, below, focus more specifically on trips to Logan Airport and downtown Boston.

The alternatives were evaluated in terms of their conformance with the Commonwealth's transportation policies. Minimized person hours of travel is a good "index" of the efficiency of a system, and its ability to provide "user benefit."

Similarly, the Preferred Alternative will allow users to reduce their total travel time by more than 17 million person hours per year, which is the highest level of user benefit of any of the alternatives.

The analysis, presented in Section 4.2 of this FEIS/FEIR, shows that each of the build alternatives can be expected to increase regional VMT somewhat. The Preferred Alternative is expected to increase the aggregate level of VMT for the region by less than 1/2 of one percent. The transportation analysis reported in Section 4.2 shows that the addition of a new tunnel is expected to have a greater propensity to "induce" new highway trips than the widening of the Central Artery. Alternative 6, "Artery-only", caused the lowest increase in VMT of the build alternatives tested.

Because of its probable role in increasing regional VMT, the Preferred Alternative has been designed to include significant measures to mitigate against this impact. Specifically, the Preferred Alternative incorporates a series of Bus/HOV (high occupancy vehicle) lanes, particularly in the complex South Bay interchange area. These lanes will allow the provision of high quality public transportation services particularly to the South and to the East (Logan Airport). As discussed in Section 4.2.8, the Preferred Alternative has been designed to provide, or coordinate with other projects which provide, improved public transportation facilities.

Diversion of Regional Traffic from Local Streets

The Preferred Alternative will remove vehicles from local streets and arteries, diverting this traffic instead to properly designed regional highways. At present, the Central Artery is so congested that drivers who would logically use it now take elaborate by-pass routes onto local streets. The performance of the Preferred Alternative in this respect is significantly better than that of the other alternatives evaluated in the FEIS/FEIR. As is noted in Section 4.2, the Preferred Alternative significantly reduces traffic on most local streets in the network by diverting this traffic back onto the regional highway network. In the downtown and North End areas, future average weekday daily traffic (AWDT) volumes will be decreased significantly, as compared to the No-Build Alternative in the year 2010, on many local streets, including Commercial Street, Causeway Street, Atlantic Avenue, North Street, and Cross Street (see Table 29 in Section 4.2.2). In South Boston, the improved highway access and capacity will reduce traffic volumes significantly on Day Boulevard as it approaches L Street (used by South Shore commuters as an alternative to the Southeast Expressway) and on D Street, when compared with the No-Build Alternative. In East Boston, the Preferred Alternative will result in significant traffic volume reductions on Porter Street, on Meridian Street, and on the Airport access road as it passes the East Boston Memorial Stadium.

Conversely, some local streets nd intersections will receive inreased traffic as a result of the roject, as presented in Table 29 in ection 4.2.2. Traffic on Congress treet at the Fort Point Channel will ncrease as a result of its connection o the Seaport Access alignment. ocal traffic on internal North End treets is not expected to be signifiantly different with either the o-Build or Preferred Alternative, as hrough traffic using North End treets (primarily Commercial Street) o avoid Central Artery congestion resently would be diverted back to he regional highway network. Howver, future traffic volumes on anover Street will be increased from ,300 vehicles per day (vpd) to 7,800 pd in 2010, a 50 percent increase. resent plans allow for either a oadway or a pedestrian way linking he southbound surface arterial with he northbound arterial at Hanover treet. The ultimate decision to ermit vehicles on this link will be etermined with public input during he design phase. If vehicles are llowed on this link, then volumes on anover Street would probably be ncreased even more than indicated in ection 4.2, with a corresponding ecrease on other North End internal streets. The project will not increase through trips into the North End. Traffic at Bell Circle in Revere is expected to increase slightly as a result of the project.

Diversion of Regional Traffic Into the Project Area

A trip which has neither origin nor destination within the area defined by Route 128 should not be encouraged into the urban core area by major changes in the travel time characteristics on the highway network. To make highway improvements which are so major as to divert thousands of regional through trips into the downtown CBD is contrary to public policy and is not the intended purpose of the Preferred Alternative. The reconstructed Artery will not represent a high-speed, free-flowing alternative route that would divert traffic through distant parts of the region. Through-traffic diversions from Route 128 represent less than one percent of the volume on the Central Artery, at any given point. However, trips with at least one end within the Route 128 area are likely candidates for diversion back to the Central Artery.

Regional Impact on Transit Ridership

The Preferred Alternative includes highway facilities which will make possible an ambitious program to provide for a Downtown/Airport shuttle bus system, for direct, free-flowing bus service from airline gate to a new remote airport passenger information center to be built by the Commonwealth at the South Station Transportation Center. This improvement in Airport ground access was previously unattainable.

As part of the FEIS/FEIR, the Central Transportation Planning Staff (CTPS) prepared forecasts of the project's effects, with its improved travel times, on regional transit ridership. The details of these analyses are discussed in Section 4.2, and are documented in Appendix 3 - TRAFFIC. The analysis showed that if, as expected, the future amount of CBD parking is constrained (by a "cap" on parking supply), the Preferred Alternative would decrease regional public transportation ridership by less than one percent. If CBD parking is as readily available as it is today (relative to increased CBD employment) the analysis indicated that the project would reduce regional transit ridership by about 1.4 percent.

As part of the Preferred Alternative, bus ramps from the South Station Transportation Center (SSTC) to the Third Harbor Tunnel, the Southeast Expressway, and the Massachusetts Turnpike are provided. These ramps will reduce the Preferred Alternative's effect on daily transit ridership loss. The ramps, in combination with transit service

improvements (not part of the project but made possible as a result of the project) which include: (1) institution of shuttle bus service between the SSTC and Logan, and (2) increased frequencies of Airport express bus and Airport limousine services, will reduce the net regional transit ridership losses even further.

In summary, the Preferred Alternative will have a small adverse effect on transit ridership in the region, if there were no changes in transit service. If transit services were also improved, the effect on transit ridership would be reduced further.

Regional and Local Bus Service Improvements

Along the Surface Artery between Essex and Kneeland Streets, an exclusive bus lane will be provided in coordination with the City's Dewey Square TSM improvements as part of the Commonwealth's larger commitment to improve the reliability of the successful Western Corridor express bus services. At the Charles River crossing, the Preferred Alternative will improve Northern Corridor express bus travel times by removing the High-Level Bridge bottleneck. From the North Shore Corridor, the project improves the possibility of new exclusive bus lane express service from Lynn to South Station and to the lower Financial District.

The project will have significant indirect implications for transit services, as local downtown streets will experience major improvements in level of service, and reductions in traffic volumes on local streets critical to MBTA bus operations.

Sources of Traffic on the Preferred Alternative

This section has reviewed the possible impact of the Preferred Alternative on diversions from transit, on diversions of through trips from outside Route 128, and on diversions from local streets. The results of this brief review suggest that as a result of the project:

o Of the 330,000 daily vehicle trips assigned to the Artery and the Tunnels, less than one percent were generated as a result of diversion from transit;

o Of the 263,000 daily vehicle trips assigned to the Artery, less than one percent have been diverted from Route 128 or beyond.

o Of the additional vehicle trips assigned to the Artery, the overwhelming majority have been diverted from local streets and arterials in the immediate core area.

1.3.2 Impact on Trip Making to Logan Airport

Trips to Logan Airport - Policy Context

It is the policy of the Commonwealth that, to the extent possible, trips to Logan Airport be made by high-occupancy vehicles. This is a strategy in which a major role must be played by: rail transit; bus transit; private bus (regional); intercity bus; vans and limousines; private car pools; and, taxis. Today, less than 15 percent of all travel to Logan is via public transportation, including bus, rail and limousine. The Commonwealth and the Massachusetts Port Authority have pursued this policy through increased promotion of shared cabs, limousines, and buses.

Currently, approximately eight percent of Logan passengers arrive by bus or limousine (in addition to approximately six percent who arrive by bus from the Blue Line Station). Preliminary studies indicate that a concentrated program to make high-occupancy vehicles a major component of the ground access to the Airport holds much promise - if the new tunnel and roadway facilities are designed to provide the necessary priority access and right-of-way.

The Preferred Alternative einforces this transportation strategy by providing direct high-ccupancy vehicle links from the egional highway network to the South tation Transportation Center and ogan Airport, and therefore supports he Commonwealth's program of creating emote airport passenger service enters.

irport-Related Traffic - Additional ehicle Trips

This FEIS/FEIR has concluded hat construction of a new harbor unnel will result in creation of more ighway trips than would occur without he tunnel in the No-Build Alternaive. This conclusion was drawn after areful study of the present patterns f travel across Boston Harbor, with articular reference to traffic to and rom Logan Airport. Travel data was xamined for several periods, docuenting that as traffic congestion ecame more of an impediment to access o the Airport, the average vehicle ccupancy rate increased. Thus, for a iven number of person-trips to the irport, fewer vehicles are used in he No-Build Alternative than in the referred Alternative. With the o-Build Alternative, use of car ools, limousines, and other shared ides increased as compared to the referred Alternative.

Thus, analysis included in the DEIS/SDEIR showed that some 6,400 daily additional vehicle trips to, and ,400 daily additional vehicle trips from (total 12,800 additional vehicle trips), Logan Airport were forecast to occur as the result of the construction of a new Third Harbor Tunnel. The majority of these new vehicle trips represented diversions from other rubber tired vehicles, resulting in a lowered vehicle occupancy factor for the Airport as a whole.

Transit Access to the Airport

Travel forecasts show that implementation of the Preferred Alternative, including the direct ramps to South Station, will increase public transportation ridership to Logan over the No-Build Alternative. A program of direct shuttle bus to South Station, and improved bus/limousine service, would increase public transportation use to Logan by about 20 percent.

The effectiveness of transit improvements to serve cross-harbor travel demands and access to the Airport as an alternative to the proposed highway improvements has also been considered in this FEIS/FEIR (see Section 2.3 ALTERNATIVES CONSIDERED IN THE EIS PROCESS). The analysis addressed a Blue Line spur to the Airport, increased ferry service, and increased bus/limousine service. It was found that implementing the Blue Line spur and expanding the ferry service were not as effective as a strategy to improve access by high-occupancy rubber-tired vehicles alone.

Relationship to Airport Growth

Studies clearly indicate that the rate of growth of airport activity is determined principally by powerful regional and national economic forces, and any correlation with the quality of auto access seems weak. Transportation analysts believe that as auto-access conditions deteriorate, the result is a "spreading of the peak" in which more time is allocated by the user to the task of getting to the airport. The number of hours of peak period congestion conditions subsequently grows, and the traveler plans his/her time accordingly. In short, there is no evidence that failure to improve highway access represents a meaningful strategy to limit airport activity growth, if this is the desired action.

However, there is ample evidence that failure to deal with problems of auto access contributes directly to the worsening of affected neighborhood environments. As highway access conditions get worse, drivers increase their use of local residential streets to "by-pass" the con-

gested highways. Public policy actions will have to deal directly with this problem, to ensure that airport (regional) related environmental problems do not occur on residential streets.

Land Use Impacts of Increased Vehicle Trips

Activity at Logan Airport will continue to grow with or without improved highway access. Therefore, it is critical that land use impacts such as intrusion of airport-related activities into adjacent residential neighborhoods be dealt with immediately by appropriate public bodies. A program to review the impact of zoning and other land use control mechanisms, including various de facto licensing functions of Massport, and the creation by Massport of off-Airport industrial parks in appropriately zoned areas, will be undertaken immediately by the Commonwealth as one element of a total program of mitigation.

1.3.3 Effect of the Project on Trips to Downtown

It is the policy of the Commonwealth to serve downtown Boston primarily by public transportation. This is a commitment shared by the MBTA, the MDPW, and Massport, each of which is directly involved in providing mass transportation services.

Public transportation must remain the primary method for individual access to downtown Boston, making possible the use of the region's highway system for those whose trips cannot be well served by public transportation. For example, goods movement and passenger trips with neither origin nor destination in the transit-rich core area are dependent upon adequate highway access.

This FEIS/FEIR indicates that the Preferred Alternative will not have a significant effect on transit ridership (see Section 4.2.8 OTHER TRANSPORTATION FACILITIES). Past studies and research by others have shown that changes in public transportation ridership are best explained as a function of the quality and price of that service and the socio-economic characteristics of its ridership rather than by changes in the quality of the highway system.

Impact on Transit Service for Trips to Downtown

The Preferred Alternative should serve to improve the quality of transit service to downtown. At several key bottleneck locations presently impeding MBTA bus service, the Preferred Alternative will provide for significant reductions of traffic congestion, when compared with the No-Build Alternative. Locations such as Keany Square at the Charlestown (North Washington Street) Bridge, and Dewey Square at South Station, will experience significant decreases in roadway traffic volumes due to the project. Along the Surface Artery, between Essex and Kneeland Streets, the project will help to make possible a new MBTA express bus lane to serve the Western Corridor express bus system; the project includes a new express bus lane for bus service from the South Shore, with direct connections to the new South Station Transportation Center. All of these traffic improvements should improve the quality and reliablity of transit service to the downtown.

Increase in Vehicle Trips

The possible impact of the project on increasing highway trips to downtown Boston has been reviewed. Based on discussions with the Boston Redevelopment Authority and other responsible organizations, it has been reaffirmed that the absolute number of vehicle trips made to the downtown area in the design year will be a direct function of the number of downtown parking spaces available and the pricing policies in force at that time and thus, not significantly affected by improvements in highway travel times.

It can reasonably be assumed that the improvement in highway travel time will cause some diversion from transit to car-pools, and other high occupancy vehicle situations, even though the number of vehicles parked downtown is held constant.

A possible impact of the proposed highway improvement could be increasing the length of the fixed number of trips to the downtown area. Transportation analysts concur that this sort of alteration of tripmaking does occur as the result of major improvements to the highway network. However, this phenomenon would have no effect on the accuracy of highway traffic projections within the study area. It is expected that the proposed project would produce a minute effect on increasing the number of through trips, but would have no effect on the number of trips with origins or destinations in the downtown area.

1.3.4 Traffic Forecasting Methodology

In order to calculate the value and distribution of benefits and costs of a transportation improvement, it is first necessary to predict the change in traffic which will result from any proposed transportation improvement. The calculation of traffic flows, or change in flows, is determined by the traffic forecasting process. Section 4.2.5 details strengths and weaknesses of the forecasting process, including a discussion on induced trips, use of a fixed trip table, traffic forecasting and Logan Airport, and the relationship of traffic and land use forecasts. After review of the forecasting process and related assumptions, it is concluded that the process is totally adequate to support and clarify the decision to select a Preferred Alternative.

1.4 MAJOR UNRESOLVED ISSUES

Many of the environmental issues raised during review of the SDEIS/SDEIR have been addressed during the development and refinement of the Preferred Alternative. Some of the major issues which will need additional attention and resolution during the preliminary engineering design phase are summarized below.

1.4.1 Air-Rights Joint Development

The SDEIS/SDEIR presented preliminary concepts for the development of the approximately 20 acres that will be created above the depressed Central Artery. Analysis of the Preferred Alternative in the FEIS/FEIR has stressed both the content of the joint development and the public planning process. The development potential of each parcel has been examined with respect to use, building massing, subsurface structural requirements and relationship to surrounding areas. These concepts are presented as a starting point for the next steps in the process.

This FEIS/FEIR presents proposals for the planning process itself. Major emphasis is placed on a community-based task force approach to the planning of specific subareas. The Commonwealth recognizes its responsibility to assure the participation of community representatives, selected public agencies, and private organizations, and to establish financing mechanisms for developers to provide for any necessary additional foundation support at the time of tunnel construction.

These important considerations are described in greater detail in Section 4.4.4 Joint Development.

1.4.2 North Station/Charles River Basin

This area is the focus of proposals by several public agencies and private property owners. Between the old and new Metropolitan District Commission (MDC) dams, current Boston Redevelopment Authority (BRA) proposals for redevelopment of the area are not consistent with MDC proposals for extension of Charles River Reservation pedestrian walkways

along the River's edge. BRA and MDC proposals are conceptual at this time. The MDC has not yet received appropriations to purchase or improve the River banks according to its proposals, while the BRA is focusing its attentions on the Causeway Street/ Lomasney Way area of its Urban Renewal Project. Inconsistencies between these agency proposals have to be resolved before the impacts of the Preferred Alternative can be established and specific mitigation measures incorporated into the project.

1.4.3 Ventilation of Tunnel Sections

Analysis of the air quality impacts of the exhausts from tunnel ventilation buildings at many of the ventilation building locations indicates that there will be a serious violation of the Massachusetts DEQE, but not of Federal, NO^2 emisssion standards. The Commonwealth is committed to refining the proposed ventilation system and performing additional air quality analysis to assure conformance with the NO_2 policy level. Preliminary analysis suggests that mitigation measures can be developed to overcome these violations.

Mitigation measures will be studied for all Central Artery/Third Harbor Tunnel ventilation buildings exceeding the State's policy level for NO^2, including the ventilation buildings near the Harbor Towers, at the Callahan Tunnel portal, and Causeway Street. Possible mitigation measures include increasing the height of ventilation exhausts to be further from the air intakes and operable windows of existing nearby buildings; increasing the number of ventilation buildings to decrease the length of tunnel ventilated by each building, and achieving a more diffuse source of NO_2; increasing the mechanical ventilation equipment in the ventilation buildings; etc.

These and other measures to minimize NO_2 emission impacts will be studied and resolved during preliminary engineering design based on extensive continued coordination with DEQE and EPA air quality staffs; coordination with decisions about joint development of air-rights will also take place at that time.

1.4.4 Dredged and Excavated Material Disposal

Specific locations for disposal of excavated and dredged materials have not been determined, although both potential land and ocean sites have been identified. During preliminary design, when the quantity and quality of this material is better known, specific sites will be analyzed and additional environmental documentation will be prepared as necessary. See Section 4.13 DREDGED AND EXCAVATED MATERIAL DISPOSAL for further detail on this subject.

1.4.5 Other Issues

In addition to the aforementioned major unresolved issues, other construction period impacts must also be evaluated in greater detail, and mitigating measures developed. For example, construction-period traffic detours, and the resulting effects on traffic operations, air quality, etc., have not been fully analyzed. These routes will be developed further during the design phase, and additional traffic and air impact analyses will be prepared.

Other issues have been specifically identified as requiring additional engineering and environmental study during preliminary design to further identify and mitigate, if possible, adverse impacts. These issues are as follows: fabrication site (if applicable); parking impacts; Phase II Archaeological Survey and final mitigation details; construction staging and sequencing; and relocation impacts. Many of these issues are discussed to the extent possible based on the present level of design, in Chapter 4.0 ENVIRONMENTAL CONSEQUENCES of this FEIS/FEIR.

2.0 DESCRIPTION OF ALTERNATIVES

2.1 GENERAL

The following sections describe the Preferred Alternative and reasons for its selection; alternatives considered during the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) process; reasons for the Commonwealth's rejection of all alternatives other than the Preferred Alternative; and a discussion of the various considerations affecting the alignment of the Preferred Alternative. It is organized as follows:

- o Preferred Alternative;
- o Alternatives Considered in the EIS/EIR Process;
- o Effectiveness of the EIS/EIR Alternatives in Achieving the Commonwealth's Transportation Objectives; and,
- o Design Considerations for the Preferred Alternative.

2.2 PREFERRED ALTERNATIVE

As a result of the extensive public input received during the public review and comment period on the SDEIS/SDEIR, and a review of the environmental impacts of all alternatives evaluated, the Commonwealth of Massachusetts has selected Alternative 5A Modified (depressed and widened Central Artery plus the Seaport Access Alignment Third Harbor Tunnel) as the Preferred Alternative.

During the public review and comment period on the SDEIS/SDEIR, five formal, public informational meetings were held in the various neighborhoods directly affected by the project (South End/Chinatown, South Boston, East Boston, North End, Waterfront), in addition to many meetings with citizen groups. The purpose of these informational meetings was to present the alternatives being considered and discuss the concerns of area residents, businesspersons, public officials, and civic leaders. Two 12-hour public hearings were held at Faneuil Hall. During the public hearings, more than 100 individuals presented testimony on the project, with the majority of those attending voicing support for the Alternative 5A Modi- fied concept. The Public Hearing Transcript, along with a synopsis of the testimony and responses to verbal comments, has been published as a separate volume to this FEIS/FEIR.

Following the public hearings, local elected officials in the area, including the (former) Mayor of the City of Boston, also endorsed the Alternative 5A Modified concept. The Metropolitan Planning Organization for the Boston area, which includes representatives from the Massachusetts Port Authority, Massachusetts Bay Transportation Authority, Metropolitan Area Planning Council, and others, has also endorsed the project (see COMMENTS AND COORDINATION, Exhibit A).

In response to the many comments received, the Preferred Alternative incorporates further modifications than those identified in the SDEIS/SDEIR as the Alternative 5A Design Modifications. Several of these modifications include: elimination of a Third Harbor Tunnel exit directly to Albany Street and inclusion of the Herald Street Extension; inclusion of bus/high occupancy vehicles lanes and ramps to the South Station Transportation Center; and improved access, both northbound and southbound, from the Financial District/Dewey Square area by ramp changes in the Dewey Square Tunnel. The basis for these and other additional refinements are discussed in Section 2.5.1 Derivation of the Preferred Alternative.

2.2.1 Description

The Preferred Alternative increases traffic capacity on the Central Artery (north-south) by widening the existing facility (total

length approximately 3.0 miles). Cross-harbor capacity (east-west) is increased by construction of a Third Harbor Tunnel through South Boston linking the Massachusetts Turnpike/ Central Artery interchange in Boston with Bird Island Flats, Logan Airport, and Route 1A in East Boston (total length approximately 3.9 miles). The project extends from a point on the Central Artery just north of the Southeast Expressway/Massachusetts Avenue interchange to a point on Interstate Route 93 in Charlestown approximately 700 feet north of the Gilmore Bridge; and from the Massachusetts Turnpike/Central Artery interchange to a point on Route 1A in East Boston in the vicinity of Prescott Street, via South Boston, Boston Harbor, and Logan Airport. The Third Harbor Tunnel alignment is also called the Seaport Access Alignment because it provides direct access to and from the regional highway system and the northern "seaport" sector of South Boston. Figure 2 presents possible typical sections of the depressed Central Artery and the Third Harbor Tunnel (not included, but also a possibility, is a binocular steel tunnel for the cross harbor sunken tube). Figure 3 presents an overview of the proposed Preferred Alternative alignment. Figures 3A through 3E present more detailed plans of the Preferred Alternative.

A description of the Preferred Alternative by subarea follows. The description begins in the South Bay/Fort Point Channel area of the project, proceeding northerly with the Central Artery portion of the project. After completing the Central Artery description, the discussion returns to the South Boston area and proceeds across the Harbor with the Third Harbor Tunnel description.

South Bay/Fort Point Channel Area

In the southernmost section of the project, the Preferred Alternative meets the Southeast Expressway Upgrading project in the vicinity of the Massachusetts Avenue interchange (see Figure 3A). A major interchange with the Massachusetts Turnpike/Central Artery/Southeast Expressway/Seaport Access Tunnel is provided, including a special purpose, two-lane, two-way bus/high occupancy vehicle (HOV) roadway located between the northbound and southbound Central Artery roadways, and bus ramps to/from the Third Harbor Tunnel. The HOV roadway and bus ramps will enter the bus station level of the South Station Transportation Center, and will provide exclusive bus transit links between Logan Airport, South Station, and points south and west of the City.

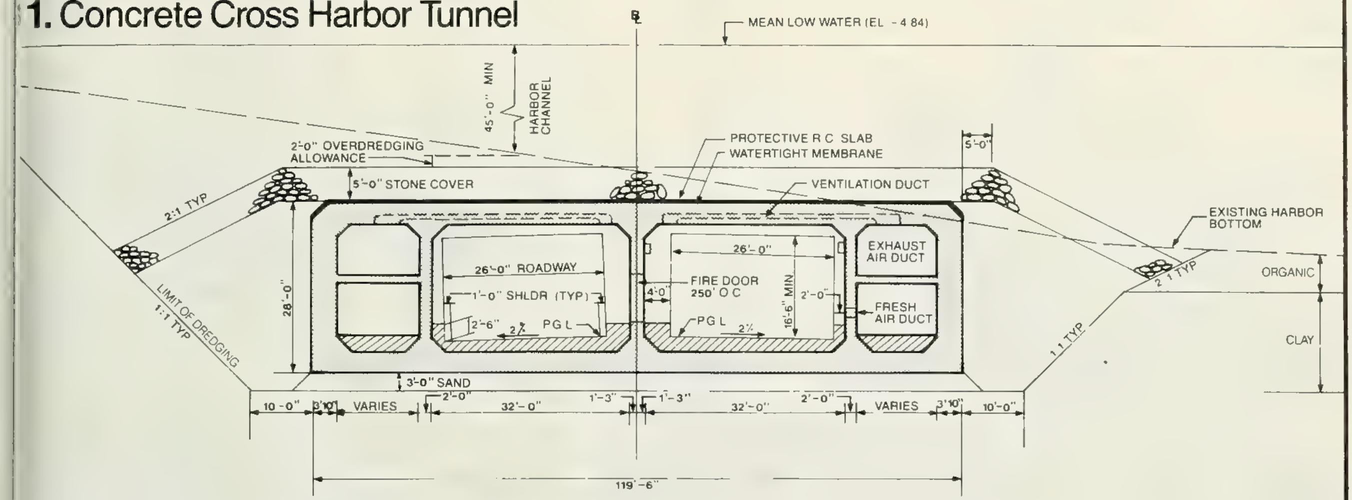
In the vicinity of this interchange, the northbound Central Artery roadway diverges towards the east from the existing northbound roadway, passes over the West Fourth Street Bridge, and then descends into a tunnel which passes under a new Herald Street Extension Bridge and Wye Connector. Within the tunnel, the roadway splits, with the Seaport Access tunnel diverging to the right and the Central Artery northbound tunnel to the left.

Near the southern end of the South Postal Annex and within the Fort Point Channel, the Central Artery tunnel also merges with a tunnel from the Massachusetts Turnpike and from Frontage Road. This four-lane tunnel is located below the bottom and along the west edge of the Channel as it passes opposite the Gillette Company plant in South Boston. This tunnel will carry all northbound Central Artery traffic. Five of the six lanes of the Dewey Square Tunnel will carry southbound Central Artery traffic; one lane will be used by the Lincoln Street and South Street ramps.

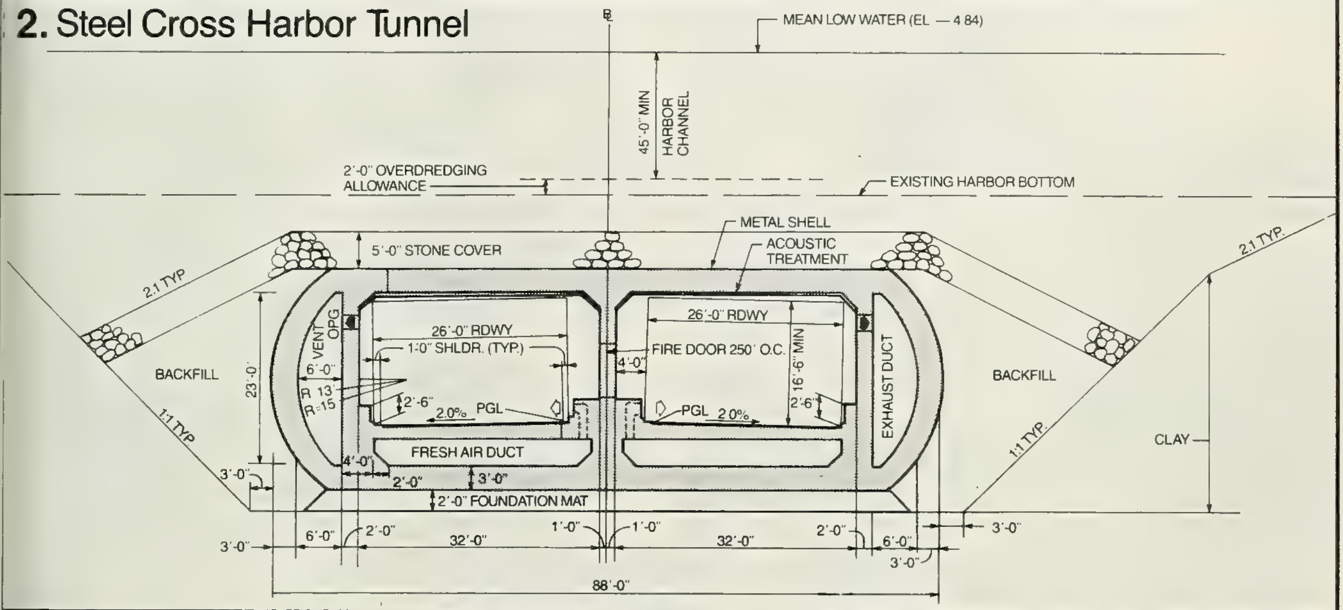
The Seaport Access tunnel (two-way, four-lanes plus weaving lanes) crosses the south end of the Fort Point Channel. The profile is set so the top of the tunnel box is near the bottom of the existing Channel. This tunnel crosses over the MBTA Red Line tunnel and the Central Artery northbound tunnel.

Surface roadways are to be

1. Concrete Cross Harbor Tunnel



2. Steel Cross Harbor Tunnel



3. Depressed Central Artery

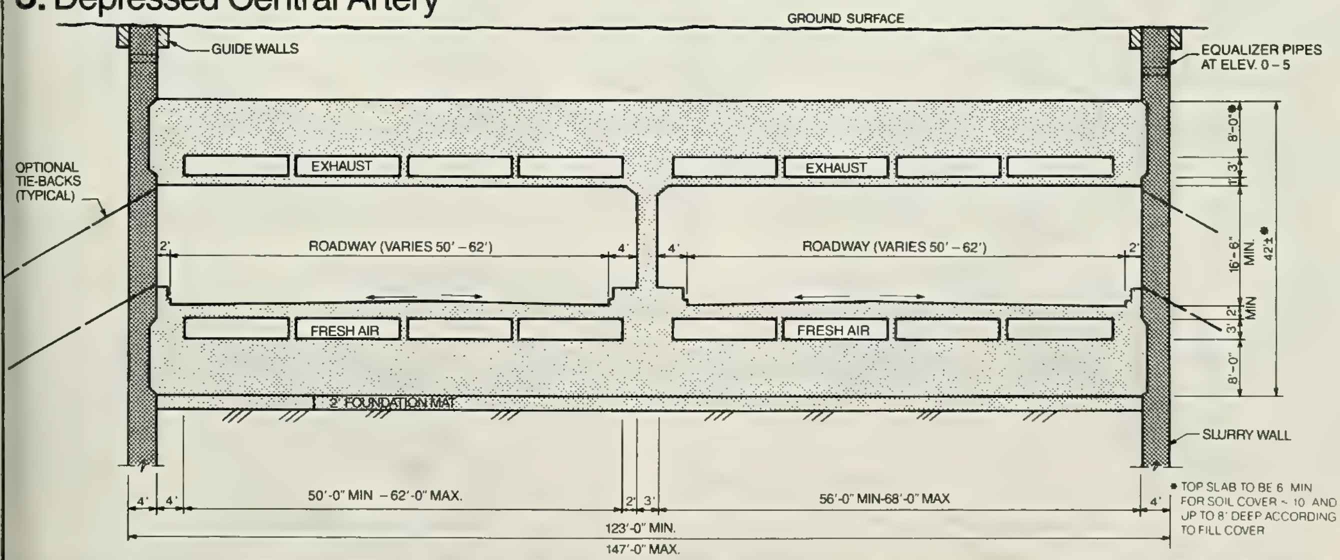
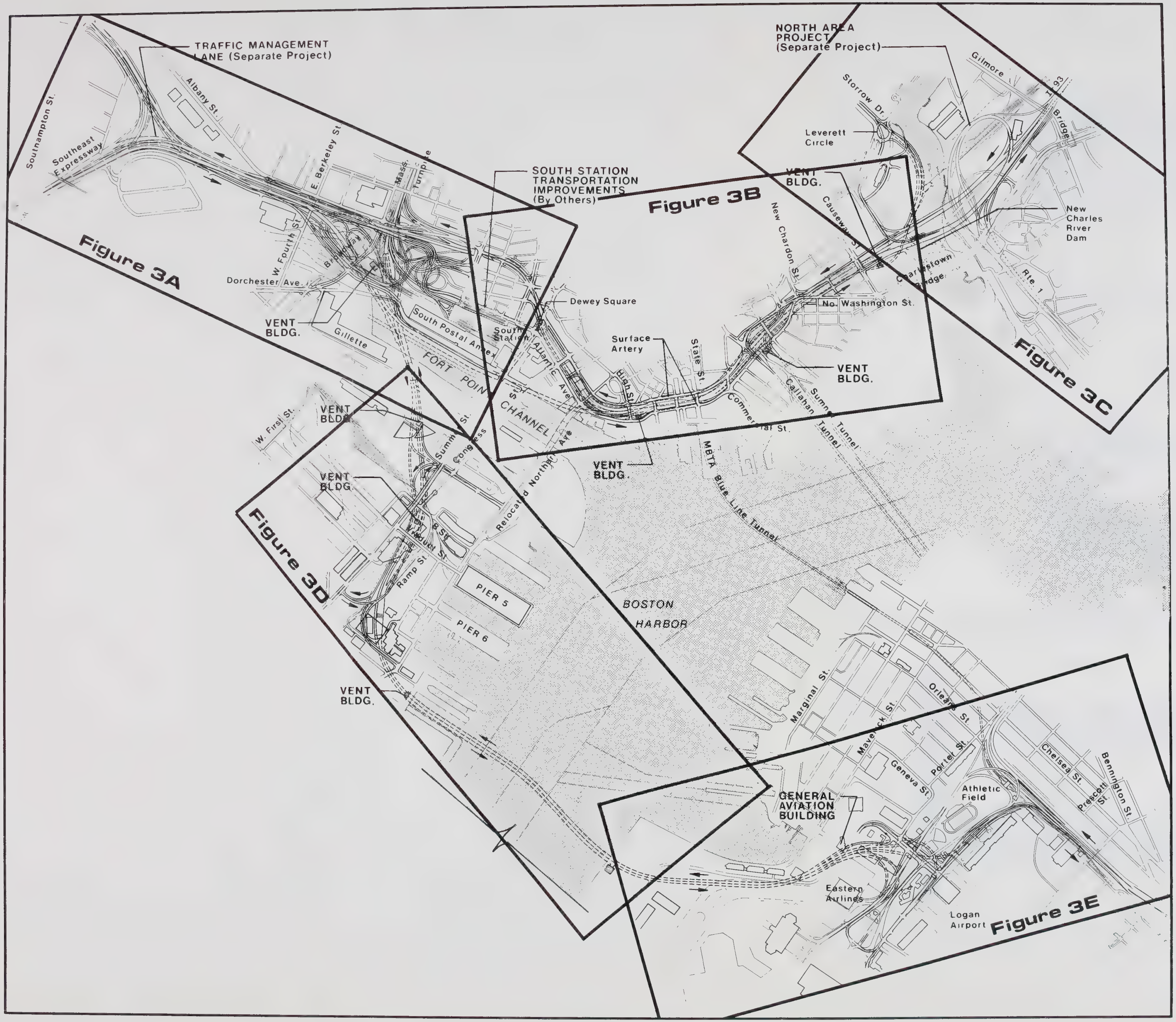


Figure 2

Typical Sections

EIS/EIR for I-90–Third Harbor Tunnel; I-93 Central Artery



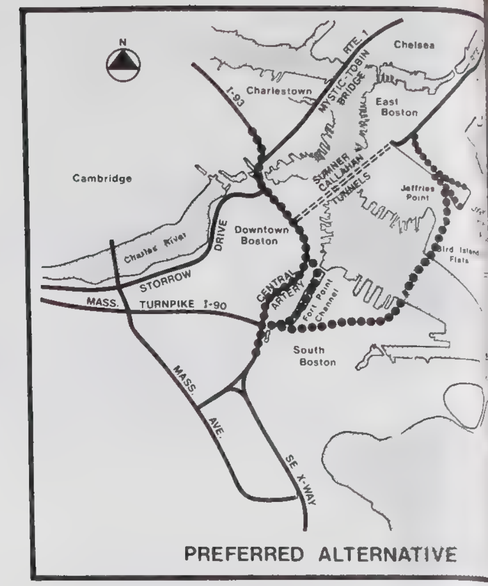


Figure 3
Preferred Alternative
General Plan

0 750 1500 Feet

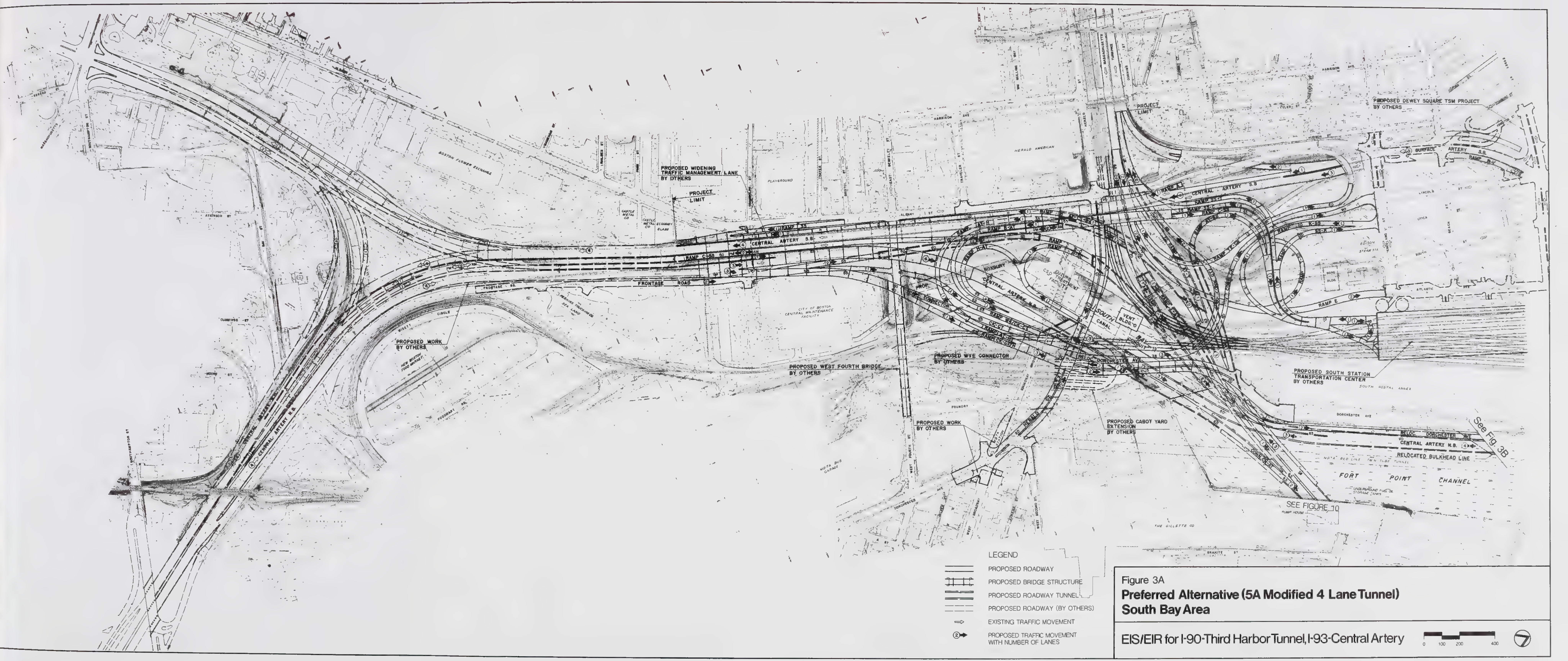


Figure 3A

Preferred Alternative (5A Modified 4 Lane Tunnel)
South Bay Area

EIS/EIR for I-90-Third Harbor Tunnel, I-93-Central Artery

constructed and/or modified in this area as part of this project. The existing Broadway Bridge will be replaced by a new bridge realigned slightly to the north and designated the Herald Street Extension. The Herald Street Extension (four-lanes, median separated) will extend from Albany Street in Boston to West Broadway and Dorchester Avenue in South Boston. Portions of Frontage Road and Albany Street will also be reconstructed. A new two-way, four-lane relocated Dorchester Avenue will extend from Herald Street Extension to the vicinity of the present Dorchester Avenue Bridge. At this point, the southbound lanes will connect only to the South Postal Annex. A northbound general purpose, two-lane relocated Dorchester Avenue will extend to Summer Street. It will be constructed as a bridge/pier structure above the northbound Central Artery tunnel. The existing Dorchester Avenue, between Summer Street and Congress Street, will be reconstructed as a two-way roadway.

In addition to the major traffic movements provided from the Massachusetts Turnpike/Central Artery/ Southeast Expressway/Seaport Access tunnel interchange, ramps accommodating the following traffic movements will also be provided:

Off-Ramps

- o Northbound Central Artery to Herald Street Extension at relocated Dorchester Avenue;
- o Northbound Central Artery to Kneeland Street at Lincoln Street;
- o Westbound Third Harbor Tunnel to South Station Transportation Center;
- o Eastbound Massachusetts Turnpike to Atlantic Avenue and to South Station Transportation Center; and
- o Westbound Seaport Access tunnel to Herald Street Extension.

On-Ramps

- o West Fourth Street to westbound Massachusetts Turnpike;
- o Albany Street to southbound Central Artery;
- o Herald Street Extension to eastbound Seaport Access tunnel;
- o Frontage Road to westbound Massachusetts Turnpike; and
- o Frontage Road to northbound Central Artery.

A ventilation building, approximately 100 feet high, is proposed in the South Bay area in the vicinity of Herald Street Extension.

Central Area

Between High Street and Causeway Street, the existing six-lane Central Artery will be depressed, widened to four lanes in each direction plus auxiliary and/or weaving lanes, and decked over to allow new development on the ground level. The new tunnel will be located principally within the existing Central Artery corridor, and will pass over the MBTA's Blue Line Tunnel at State Street (see Figure 3B).

The northbound Central Artery tunnel in the Fort Point Channel will rise to cross over the MBTA Red Line tunnel at Summer Street; the top of the tunnel box will be above the mean low water level at a point about 400 feet south of Summer Street. The northbound Artery tunnel will then veer slightly to the west, leaving the Channel near the existing bulkhead line at Russia Wharf. The four-lane northbound tunnel will continue northerly, passing under the Boston Edison parcel, the Harbor Plaza Building, and the Hook Lobster Company site, and will rejoin the existing Central Artery corridor in the vicinity of High Street. South of High Street, the southbound Central Artery will operate through five lanes of the existing Dewey Square Tunnel.

Figure 3B
Preferred Alternative (5A Modified 4 Lane Tunnel)
Central Area

EIS/EIR for I-90-Third Harbor Tunnel, I-93-Central Artery

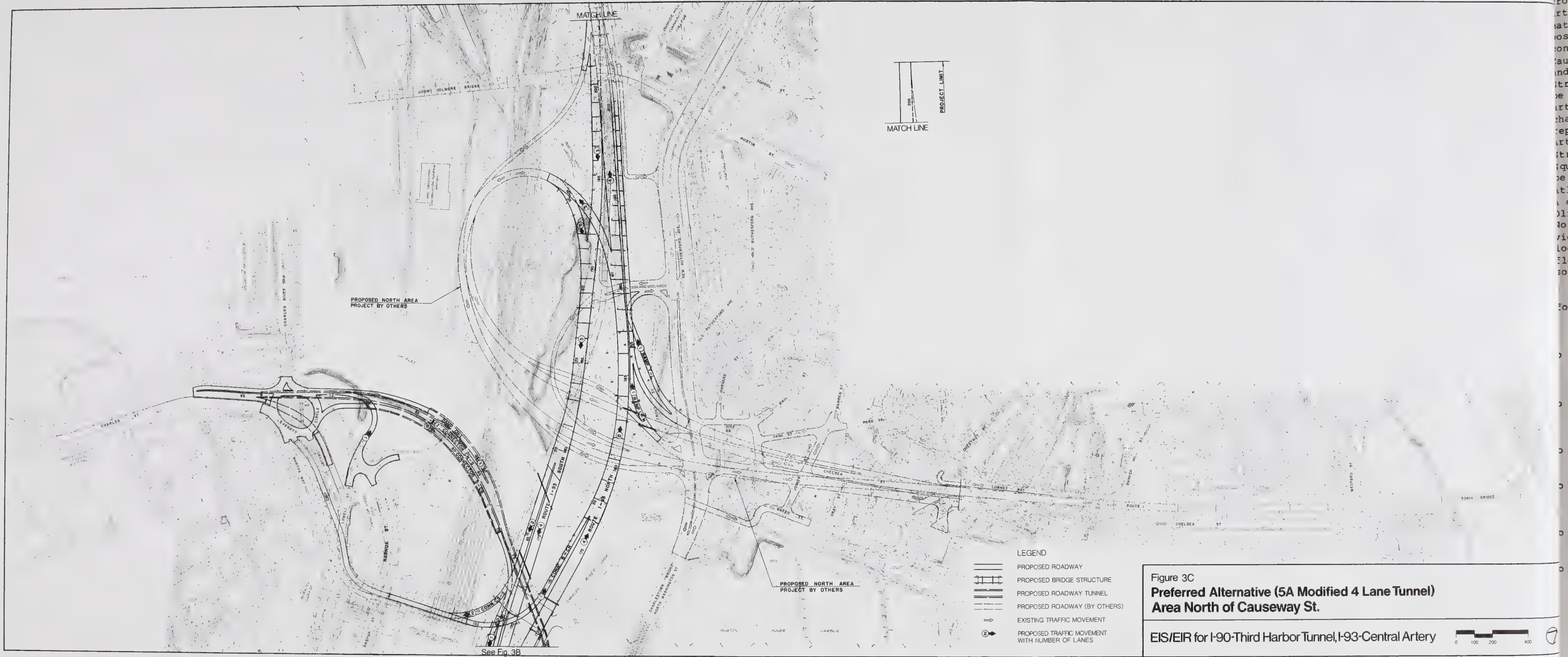


Figure 3C
Preferred Alternative (5A Modified 4 Lane Tunnel)
Area North of Causeway St.

EIS/EIR for I-90-Third Harbor Tunnel, I-93-Central Artery

The surface roadways along and crossing under the existing Central Artery will be rebuilt in approximately their present locations, where possible. A surface arterial street connecting Atlantic Avenue with Causeway Street (one-way northbound), and Causeway Street with Purchase Street (one-way southbound) will also be built. The southbound surface arterial will be extended from Purchase Street to Kneeland Street, replacing the existing two-way Surface Artery from Summer Street to Kneeland Street as part of the proposed Dewey Square TSM project. A connection will be provided at Pearl Street, between Atlantic Avenue and Purchase Street. A one-way eastbound connection from Oliver Street to Atlantic Avenue and Northern Avenue will also be provided. Other U-turns have been located to allow efficient traffic flow between the northbound and southbound surface arterial.

Ramps will be provided as follows:

Off-Ramps

- Northbound Central Artery to Surface Artery near North Street (two-lanes);
- Northbound Central Artery to Storrow Drive and Leverett Circle (two-lanes);
- Southbound Central Artery to Causeway Street;
- Southbound Central Artery and Surface Artery to the Callahan Tunnel;
- Southbound Central Artery to Purchase Street; and
- Southbound Central Artery to southbound Surface Artery at Summer Street and at Beach Street.

On-Ramps

- Essex Street at South Street to Central Artery northbound;
- Atlantic Avenue at Northern Avenue to Central Artery northbound;
- Sumner Tunnel to Central Artery northbound and to Surface Artery;
- Causeway Street to Central Artery northbound;
- Southbound Surface Artery at New Sudbury Street to Central Artery southbound;
- Purchase Street at Congress Street to Central Artery southbound (2 lanes); and
- Lincoln Street at Essex Street to Central Artery southbound.

Four ventilation buildings have been proposed in the following areas: at Northern Avenue; at Atlantic Avenue (just north of High Street); at North Street; and to the rear of the Hoffman Building near North Station (Causeway Street). Ventilation structures are expected to be approximately 100 feet high. Ventilation building locations shown on Figure 3B must be subjected to additional air quality analysis.

North of Causeway Street Area

North of Causeway Street, the depressed Central Artery will emerge to the surface through a portal and rise to a viaduct. It will then cross over the Charles River on two truss bridges and rejoin the existing Interstate Route 93 double-decked viaduct approximately 700 feet north of the Gilmore Bridge in Charlestown (see Figure 3C).

The tie-in with the double-decked viaduct in Charlestown will involve some changes to the ramps as

presently proposed for the MDPW's North Area project, but no change in the basic concept of that project.

Portions of the existing viaduct ramps behind North Station will be retained to accommodate the high-level ramps between the Central Artery to the north and Storrow Drive/Leverett Circle to the west.

The ramps connecting the northbound Central Artery and Storrow Drive/Leverett Circle, and connecting eastbound Storrow Drive to the Central Artery southbound, will be built in a tunnel under the MBTA's commuter rail tracks at North Station and along the Charles River's edge. Nashua Street will be realigned to pass over the Storrow Drive/Central Artery tunnel ramps, and will merge with traffic on the Central Artery to Storrow Drive/ Leverett Circle ramp just prior to entering Leverett Circle.

The existing Central Artery viaduct, the double-decked High-Level bridge over the Charles River, and portions of the double-decked Interstate Route 93 structure in Charlestown will be removed after the new Charles River bridges become operational.

Ramps will be provided as follows:

Off-Ramps

- o Central Artery northbound to Storrow Drive/Leverett Circle (two-lanes); and
- o Central Artery southbound to Leverett Circle/Storrow Drive (two-lanes) and to Causeway Street;

On-Ramps

- o Causeway Street to Central Artery northbound;
- o Storrow Drive/Leverett Circle to Central Artery northbound; and
- o Storrow Drive/Leverett Circle to Central Artery southbound (two-lanes).

South Boston/Seaport Access Area

After crossing under the south end of the Fort Point Channel into South Boston (as previously shown on Figure 3A), the Seaport Access tunnel will cross Gillette Company and Boston Wharf Company properties and pass under A Street, Summer Street, B Street, and Viaduct Street to an open, depressed toll plaza (one-way) in the Commonwealth Flats area (see Figure 3D). From the toll plaza area, the roadway will enter a portal and curve towards the north, passing through Boston Economic Development and Industrial Corporation (EDIC) property as it approaches Boston Harbor at the western edge of the Boston Marine Industrial Park (BMIP). A Conrail freight track serving the area will also be relocated as part of the project.

After passing to the west of BMIP in South Boston, the Third Harbor Tunnel (two-way, four-lanes) will cross under Boston Harbor, passing under the main shipping channels. The tunnel will reach land at the Bird Island Flats area of Logan Airport.

Access to and from the northbound and southbound Seaport Access tunnel will be provided from Congress Street and Northern Avenue, near Pier 4. A two-way service road will be constructed from Northern Avenue to Congress Street near the western edge of Commonwealth Flats. Access to and from the south will be provided at Summer Street and Northern Avenue near BMIP. These ramps will not provide access to the cross-harbor tunnel. Portions of Summer Street, Viaduct Street, and B Street will also be reconstructed.

Tolls will be collected inbound only. The Summer Street and Northern Avenue on-ramps to the southbound tunnel will be toll free, providing

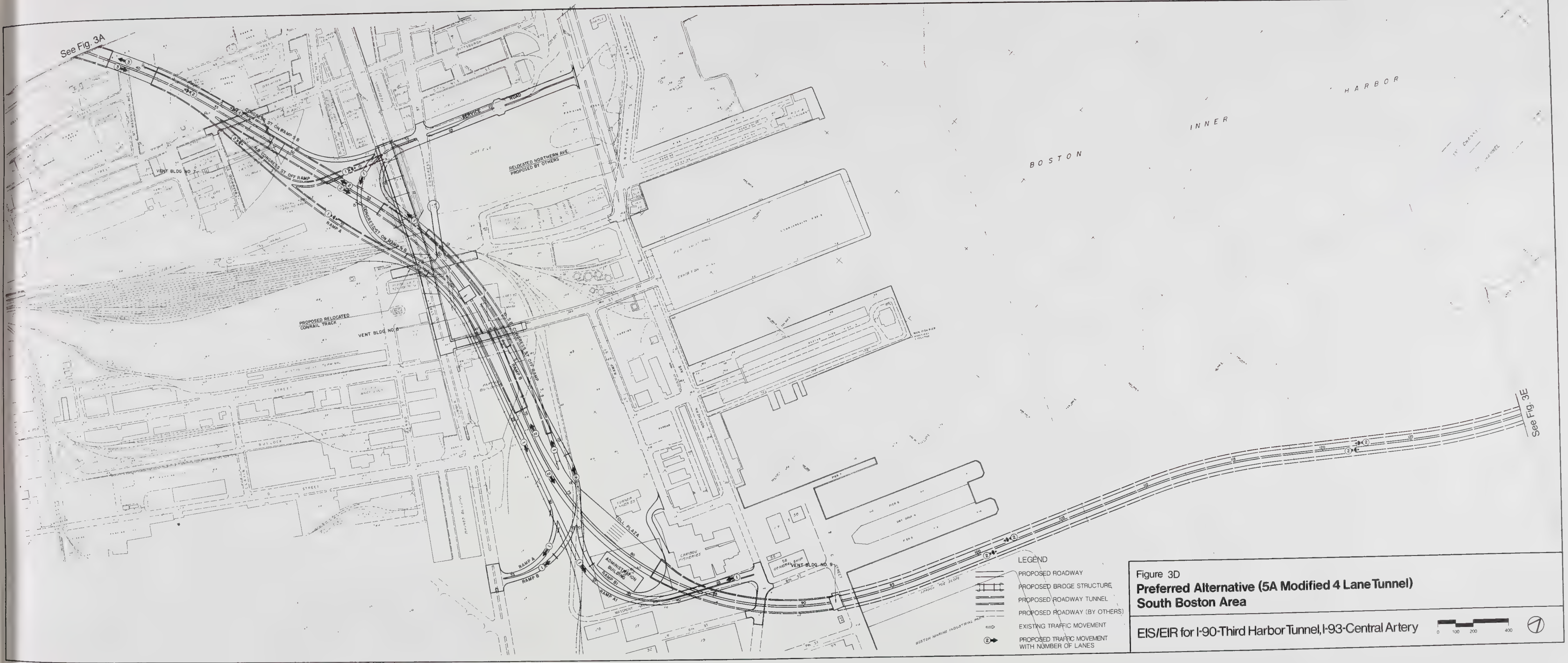


Figure 3D
Preferred Alternative (5A Modified 4 Lane Tunnel)
South Boston Area

EIS/EIR for I-90-Third Harbor Tunnel, I-93-Central Artery

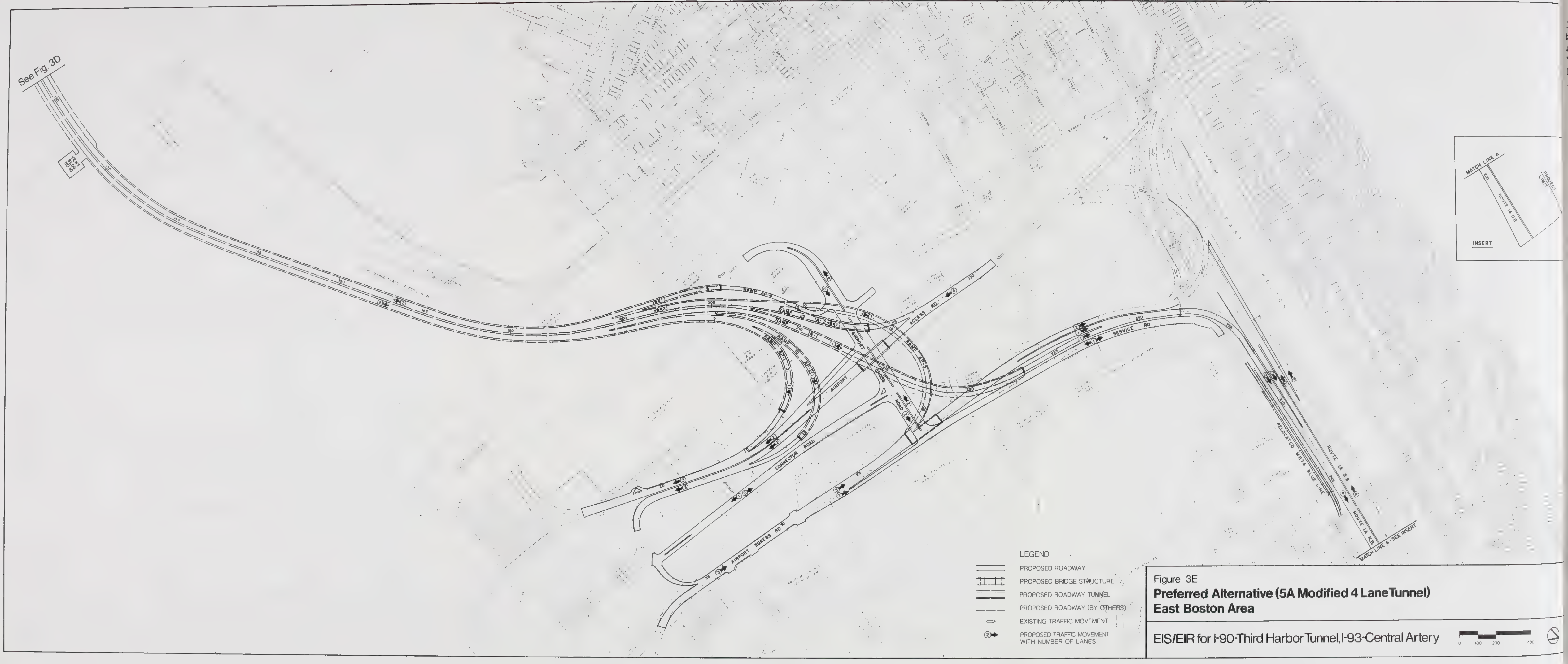


Figure 3E

Preferred Alternative (5A Modified 4 Lane Tunnel)
East Boston Area

EIS/EIR for I-90-Third Harbor Tunnel, I-93-Central Artery

free access to this facility for all vehicles.

Ventilation buildings will be located in the vicinity of A Street; between B Street and Viaduct Street; and at the BMIP near C Street. Ventilation structures are expected to be approximately 50 to 75 feet high. A Massachusetts Turnpike Authority administration building will be located in Commonwealth Flats, overlooking the toll plaza.

Logan Airport/East Boston Area

At Bird Island Flats, the four-lane tunnel will continue in a north-east direction, providing tunnel ramps to and from the Airport roadway system, generally south of the East Boston Memorial Stadium (see Figure 3E). A ramp will be provided for north-bound traffic to the Airport parking garage. Northbound traffic will continue in a tunnel, merging with a relocated Airport egress roadway providing connections to Route 1A northbound. Modifications to Route 1A south of Bennington Street, and relocation of the MBTA's Blue Line tracks south of Prescott Street will be required. Modifications to Route 1A southbound also will be provided to permit traffic to get to the southbound portion of the Third Harbor Tunnel.

This project will involve significant changes to the Airport's roadway system. The existing Cross Road will be relocated slightly to the south; the Airport access road and relocated egress road will pass under the Cross Road, eliminating the at-grade intersections. The egress road will be moved to the north side of the Hilton Hotel, and direct connections to and from the parking garage will be constructed from Cross Road. A two-way relocated service road from the air cargo area near Route 1A will also be provided, intersecting with Cross Road, and providing connections to Bird Island Flats. A direct connection to the southbound Third Harbor Tunnel will be provided from Cross Road to serve traffic exiting the Bird Island Flats development.

A ventilation building approximately 100 feet high will be constructed on Bird Island Flats, in the vicinity of where the Third Harbor Tunnel enters Airport property at the bulkhead line.

Costs

The total construction-related cost of this alternative is $2.56 billion, including property acquisition costs, based on 1982 costs. Property acquisition costs are estimated at approximately $140 million. Annual operating and maintenance costs of the existing and new toll tunnels with this alternative are estimated at $12.72 million per year. Annual operating and maintenance costs for the new freeway tunnels (depressed Central Artery and Seaport Access tunnel) are estimated at $11.12 million per year.

2.2.2 Summary of Benefits

The Preferred Alternative will represent a major improvement in traffic service and access to Logan Airport for the City of Boston, and the region as a whole. It will result in major improvements in capacity, and will significantly reduce (or, in some cases, totally eliminate) congestion on the highway network. It will also result in significant savings in travel times as compared to all other alternatives evaluated, and will provide the Commonwealth with a unique opportunity to implement major transit service improvement through creation of exclusive busway facilities linking the Southeast Expressway and Logan Airport with the South Station Transportation Center.

The following summary describes the long-term benefits of the Preferred Alternative. Details are contained in Chapter 4.0 ENVIRONMENTAL CONSEQUENCES of this document.

Transportation: Most effective in serving traffic demands during peak periods by reducing the hours of congested operation on major highway

facilities; very effective in reducing accidents on the roadway network; will improve cross-harbor access to the Airport; will remove large volumes of traffic from local streets; and will provide direct bus links between South Station Transportation Center (SSTC) and Logan Airport, and between the Southeast Expressway and the SSTC.

User Benefits: 17.6 million fewer person hours per year of travel due to major reductions in congested hours of operation.

Air Pollution: Net decrease in the region's carbon monoxide (CO) and non-methane hydrocarbons (NMHC) emissions. Of the specific locations modeled, 30 will improve in air quality (CO), and 3 will degrade slightly. Because of signifcant reductions in delays (queues), particularly at the existing toll plazas, NO_2 concentrations will be reduced, and no violations of the NO_2 standards would result. Impacts from the emissions from the ventilation system will be mitigated by additional detailed air quality analysis and modifications to the ventilation system during the design phase.

Noise and Vibration: Of the 22 sites analyzed, there are no sites where there will be a perceptible increase in noise levels; 6 sites where noise levels will be perceptibly reduced. Vibration levels along the Central Artery corridor will decrease from removal of the existing Central Artery.

Land Use and Neighborhood Cohesion: Public waterfront access to the Fort Point Channel will be provided; removal of the Central Artery viaduct will improve opportunities for the use of the resulting ground surface for community use; removal of significant volumes of traffic from many local streets; will enhance anticipated developments in northern South Boston.

Joint Development: Approximately 20 acres of new prime downtown land will be created. This land could be used for housing, parks, recreation, or commercial uses.

Economics: Will provide approximately 77,000 person years of employment, including an estimated 13,950 person years of employment for Boston residents; will create most improved access to South Boston area, enhancing development; significant increases in anticipated tax revenues.

Aesthetics: Large areas will be reunited with visual corridors to the waterfront, benefitting thousands of downtown users and residents.

2.3 ALTERNATIVES CONSIDERED IN THE EIS PROCESS

2.3.1 DEIS/DEIR Alternatives

In December 1982, a Draft Environmental Impact Statement/ Environmental Impact Report (DEIS/ DEIR) was prepared which evaluated the No-Build Alternative and four Third Harbor Tunnel only alternatives as discussed in the Corridor Planning Study. The alternatives evaluated in detail in the DEIS/DEIR are briefly described below. At that time, it was assumed that deck replacement of the Central Artery would be undertaken as a separate project; the effects of deck replacement were therefore not addressed in that document.

Alternative 1: No-Build

The "No-Build" Alternative proposed no new cross-harbor tunnel construction as part of this project. Construction of a traffic management lane to improve traffic flow, generally within and between the Massachusetts Avenue and Massachusetts Turnpike interchanges on the Central Artery and Southeast Expressway, and improvements to the deck of the Central Artery would be carried out as separate projects by the MDPW. These transportation improvements were assumed as "given" future conditions for all five alternatives. Other roadway modifications, such as replacement of the Northern Avenue Bridge in South Boston by the MDPW, transportation improvements at South Station by the MBTA and the City of Boston, the Atlantic Avenue Phase 3

improvements by the MDPW, and circulation improvements at Logan Airport in East Boston by Massport were also considered as separate projects. Also assumed to be in operation was the MDPW's Central Artery North Area Project in Charlestown.

Alternative 2: Split Alignment Tunnel; Railroad Alignment

Alternative 2 involved construction of a one-way, five-lane northbound tunnel from the Massachusetts Turnpike/Central Artery interchange through Fort Point Channel. Near the mouth of the Channel, this one-way tunnel split, with three toll-free lanes reconnecting to the existing, elevated Central Artery northbound and two lanes continuing across Boston Harbor to a new toll plaza in East Boston. The cross-harbor tunnel's two southbound lanes were next to the northbound lanes, in a single structure from the East Boston toll plaza to the mouth of Fort Point Channel in Boston. In that area, they split, connecting to the southbound Central Artery just north of the existing Dewey Square Tunnel. All six lanes of the Dewey Square Tunnel became one-way southbound.

In East Boston, the tunnel was located within the Conrail railroad right-of-way and industrial land next to Bremen Street, with an open toll plaza located between Gove and Porter Streets.

The project included connections to the Southeast Expressway, Central Artery, Massachusetts Turnpike and Frontage Road in South Boston (on ramp); Summer Street in Fort Point Channel (on ramp); and the Airport access and egress roads and Route 1A in East Boston.

A new two-way, four-lane Dorchester Avenue was also included above the tunnel structure in Fort Point Channel, with connections to the Central Artery, Frontage Road, and cross streets.

The cost of Alternative 2, including construction and property acquisition, was estimated to be $749 million in 1982 prices.

Alternative 3: Split Alignment Tunnel; Jeffries Cove Alignment

Alternative 3 on the Boston side of the harbor consisted of the same "split" alignment and improvements to the Central Artery as Alternative 2, including conversion of the Dewey Square Tunnel to one-way southbound operation. However, the alignment followed a more easterly course under Boston Harbor; passed under Jeffries Cove, surfaced at Logan Airport with connections to the Airport access and egress roads; and terminated at Route 1A near the existing Airport ramps. As with Alternative 2, a new Dorchester Avenue was included above the tunnel structure in the Fort Point Channel.

The cost of Alternative 3, including construction and property acquisition, was estimated to be $945 million in 1982 prices.

Alternative 4: Two-way Tunnel Alignment; Railroad Alignment

Alternative 4 involved construction of a two-way, four-lane tunnel from the Massachusetts Turnpike/Central Artery interchange in Boston through Fort Point Channel, across Boston Harbor and into East Boston along the same westerly "railroad" alignment as Alternative 2. The improvements on the East Boston side of the harbor were identical to those of Alternative 2. Alternative 4 had no direct connections with the Central Artery north of the Massachusetts Turnpike interchange, and no changes to the Dewey Square Tunnel portion of the Central Artery. Other connections were generally the same as those for Alternative 2, with additional off-ramps at Summer Street in Fort Point Channel and Albany Street in the South End. This alternative also included a relocated Dorchester Avenue above the Fort Point Channel tunnel.

The cost of Alternative 4, including construction and property acquisition, was estimated to be $735 million in 1982 prices.

Alternative 5: Two-Way Tunnel Alignment; Jeffries Cove Alignment

Alternative 5 on the Boston side of the harbor consisted of the same "two-way" tunnel alignment in Fort Point Channel and connections as Alternative 4. The alignment of this alternative continued across Boston Harbor into Logan Airport along the same easterly alignment as Alternative 3. All connections in East Boston were identical to those for Alternative 3.

The cost of Alternative 5, including construction and property acquisition, was estimated to be $927 million in 1982 prices.

2.3.2 SDEIS/SDEIR Alternatives

In March 1983, DEIS/DEIR Alternatives 2 and 4 (Railroad Alignment alternatives) were rejected by the Commonwealth's Executive Office of Transportation and Construction (EOTC) and the Massachusetts Department of Public Works (MDPW) in response to significant opposition by the East Boston community. This opposition was based on a number of factors, primarily the major disruption created by the alternatives which bisected this closely knit residential community. Addition of an open toll plaza in an area already adversely affected by the toll plaza to the existing Callahan and Sumner Tunnels was also strongly opposed by the community. Alternatives 3 and 5 remained under consideration.

Also at that time, EOTC/MDPW determined that while the Third Harbor Tunnel would improve cross-harbor travel conditions, traffic conditions on the Central Artery north of the existing Callahan/Sumner Tunnels would continue to be unacceptable, with long delays being experienced on a daily basis. Therefore, in March 1983, three new alternatives were added to the Third Harbor Tunnel Study, and a Supplement to the DEIS/DEIR was prepared.

The SDEIS/SDEIR was prepared and published for public review and comment in June 1983. The following describes briefly the alternatives evaluated in detail in that document.

Alternative 1: No-Build With Central Artery Deck Replacement

The No-Build Alternative included an analysis of the construction-period impacts of redecking the Central Artery. Deck replacement is required in the near future because of the age and condition of the existing viaduct. There would be no increase in capacity on the Central Artery. As in the DEIS/DEIR, the No-Build Alternative did not increase cross-harbor vehicular capacity since a Third Harbor Tunnel was not included.

The estimated construction cost of this alternative was $33 million in 1982 prices.

Alternative 3A: Central Artery Depression With Split Alignment Tunnel; Jeffries Cove Alignment

A tunnel in Fort Point Channel carried all northbound traffic to a widened and depressed Central Artery and to a cross-harbor tunnel running to the Airport via Jeffries Cove. The Dewey Square Tunnel would be converted to southbound operation. North of Dewey Square, the Central Artery would be widened and constructed in a tunnel through downtown Boston to a point near Causeway Street, where connections would be made to two new, lower profile bridges over the Charles River and to a modified interchange with Interstate Route 93 and Route 1.

The Third Harbor Tunnel component of Alternative 3A was a four-lane facility, connecting the depressed Central Artery with Logan Airport and Route 1A in East Boston. A local on-ramp to the tunnel at Summer Street

and off-ramp (from the Central Artery) at Purchase Street were included. A toll plaza would be located at Logan Airport, and connections to Route 1A were similar to Alternative 3. A new surface arterial was reconstructed above the depressed Central Artery; ramp connections between the Artery and the surface roads were modified; and almost 20 acres of air rights development parcels were created. As with previous alternatives, a new Dorchester Avenue was constructed above the Fort Point Channel tunnel to Northern Avenue.

Construction costs for this alternative were $1.895 billion in 1982 prices, including right-of-way acquisition costs.

Alternative 5A: Central Artery Depression With Seaport Access Tunnel; Jeffries Cove Alignment

A split alignment tunnel in Fort Point Channel carried northbound traffic to a widened and depressed Central Artery. All lanes of the Dewey Square tunnel carried southbound traffic.

In the Central Area, the extent of the project, and the capacities of the Tunnel, Central Artery and surface arterial street, were the same as in Alternative 3A in the Central Area.

A Seaport Access tunnel in the South Bay area ran easterly from the Massachusetts Turnpike/Central Artery interchange, across Fort Point Channel at its southerly end, through existing railyards and vacant land to Commonwealth Flats and Northern Avenue in South Boston. Connections to Northern Avenue were provided for both northbound and southbound traffic. The tunnel entered Boston Harbor between Piers 5 and 6, and crossed under the harbor via Jeffries Cove to a portal at Logan Airport. A toll plaza was located on Airport property, and connections to Route 1A North were provided as with Alternative 3A.

The Seaport Access route provided access to Commonwealth Flats/Seaport facilities and to Logan Airport from the regional highway system. Access to and from the depressed Central Artery was the same as in Alternative 3A, except relocated Dorchester Avenue would not be constructed as part of this alternative. Approximately 20 acres of developable land were created over the Central Artery. Six additional acres of air-rights in the South Boston area were also created.

Construction costs for this alternative were $2.187 billion in 1982 prices, including right-of-way acquisition costs.

During the preparation of the SDEIS/SDEIR, design modifications to Alternative 5A were evaluated which in- volved: (1) an alignment variation of the Seaport Access tunnel in the area of Commonwealth Flats/ Northern Avenue, including location of the tunnel toll plaza in that area rather than at Logan Airport; (2) a second interchange with Northern Avenue at the Boston Marine Industrial Park; (3) alignment variations at Logan Airport, involving construction of the four-lane tunnel under Bird Island Flats; and (4) a design variation involving construction of relocated Dorchester Avenue only as far north as Congress Street. These variations were collectively referred to in the SDEIS/SDEIR as the "Alternative 5A Design Modification" and were qualitatively discussed throughout the SDEIS/SDEIR as a compar- ison with the evaluations of Alterna- tive 5A.

Alternative 6: Central Artery Depression Without Third Harbor Tunnel

A one-way split alignment tunnel in Fort Point Channel carried all northbound traffic to a widened and depressed Central Artery. All lanes of the Dewey Square tunnel carried southbound Central Artery traffic. The project limits extended from the vicinity of the Interstate Route 93/Route 1 interchange in the

north to the Massachusetts Avenue/ Southeast Expressway/Central Artery interchange in the south.

The depressed Central Artery had four lanes in each direction, plus auxiliary acceleration, deceleration, and weave lanes. Access/egress was the same as for Alternatives 3A and 5A, except for the addition of direct tunnel ramps between the existing Callahan and Sumner Tunnels and the southbound Central Artery south of the tunnels. The capacity of the surface arterial; the ramp connections to city streets in the downtown area; construction of a relocated Dorchester Avenue above the Fort Point Channel tunnel; and the creation of development parcels above the Central Artery were similar to Alternative 3A.

Construction costs for this alternative were $1.314 billion in 1982 prices, including right-of-way acquisition costs.

2.3.3 Other Concepts in the SDEIS/SDEIR

Also included in the SDEIS/SDEIR was a re-examination of the concept of increasing Central Artery traffic capacity by widening the existing viaduct in conjunction with either widening the Dewey Square Tunnel by building either two new parallel tunnels, or building a split alignment in the Fort Point Channel. This concept included replacement of the existing bridge over the Charles River with two, lower level bridges. Although not subjected to the same level of engineering design and environmental assessment as the previously discussed SDEIS/SDEIR alternatives, the analysis was sufficient to identify potentially significant adverse impacts as compared to alternatives involving a depressed Central Artery. Although the duration of the construction period was less, the magnitude of traffic impacts during construction, particularly for regional traffic, would be significantly greater than for depressing the Central Artery. This concept also involved potential extensive historic impacts and residential displacements in the Dewey Square/Chinatown area, and did not provide other benefits of the Preferred Alternative. For these reasons, this option was rejected by the Commonwealth.

2.3.4 Other Concepts Examined in the FEIS/FEIR

Between publication of the SDEIS/SDEIR and this FEIS/FEIR, several other improvement concepts were also evaluated from an engineering and environmental perspective. These concepts are discussed briefly below. More detailed information on these alternatives is contained in the Two-Lane Tunnel/Optional Fort Point Channel Concepts report.

The Two-Lane Third Harbor Tunnel Concept was suggested in the SDEIS/SDEIR as a smaller-scale improvement to cross-harbor capacity, in response to public concerns of potential construction cost, East Boston neighborhood impacts, Bell Circle/ Revere traffic impacts, and future tolls. This concept substituted a two-lane tunnel under the harbor and provided direct access only to Logan Airport via a Bird Island Flats alignment in East Boston. The concept was an adaptation of the Alternative 5A Modified alignment, but also included direct connections between the existing Callahan and Sumner Tunnels and the Central Artery south of these tunnels (as with Alternative 6). The concept, with its "scaled down" tunnel, provided more traffic benefit than the depressed Central Artery alone, but less than the benefits of the Preferred Alternative. Although the Two-Lane Tunnel Concept could serve cross-harbor travel demands through the mid-1990s, its capacity would be exceeded well before the design year (2010), requiring additional construction at that time.

Its initial costs would be approximately $334 million less than a similarly designed four-lane cross-harbor tunnel alternative. It failed

to provide traffic relief on major portions of the Central Artery and in East Boston near the existing toll plaza. As analyzed, this concept resulted in slightly increased accident potential, particularly with the two-lane, two-way tunnel which had a cross-section similar to the existing Callahan/Sumner Tunnels (undivided). It also resulted in approximately 7.3 million vehicle hours per year less travel time savings than the Preferred Alternative, and hence slightly increased energy consumption.

Air quality impacts of this concept were not as favorable as the Preferred Alternative, particularly in the vicinity of the existing toll plaza in East Boston, which experienced significantly increased congestion relative to the Preferred Alternative. Other impacts were generally similar to those of the Preferred Alternative, except displacements were reduced in East Boston at the Airport, and dredging requirements in Boston Harbor were also reduced.

Because this concept did not accomplish the project objectives as effectively as Alternative 5A Modified, had somewhat increased traffic and safety impacts, and air quality impacts, it was not selected as the Preferred Alternative.

An Atlantic Avenue Tunnel concept was also evaluated, as a means to remove tunnel construction (northbound Central Artery) from the Fort Point Channel. This tunnel concept is technically feasible. As is demonstrated in this FEIS/FEIR, a public Dorchester Avenue is needed from the South Bay area as far as Congress Street to serve traffic demand and access to the Financial District from the south. The South Postal Annex (the region's primary mail depot and center for sorting mail and special services, with nearly 10,000 employees) owns existing Dorchester Avenue generally between Summer Street and the existing Dorchester Avenue Bridge over the Channel. The Annex requires full use of this segment of existing Dorchester Avenue for its truck loading and unloading. Since this segment of Dorchester Avenue is unavailable to the public, a new Dorchester Avenue must be constructed within the Fort Point Channel to avoid displacing the Annex. Displacement of the South Postal Annex, and the disruptions it would cause to the distribution of all mail in the Boston region, is unacceptable. Thus, attaining the transportation objectives of the project will require the creation of some new roadway capacity parallel to abandoned Dorchester Ave. in front of the Postal Annex, and some alteration of the western bulkhead line. The alternative of building both along Atlantic Ave. and the Fort Point channel does not serve to minimize environmental impacts. The Atlantic Avenue tunnel also displaced the mezzanine of the MBTA's Red Line at South Station, causing impacts to the intermodal transfer elements of the South Station Transportation Center Project. Because of the impacts to public transportation, as well as the necessary construction in the Fort Point Channel, this concept has therefore been rejected as it provides neither increased benefits nor lessened environmental impacts over the Preferred Alternative.

A Lesser-Capacity Dewey Square option, in which the Dewey Square Tunnel continued to serve two-way traffic, was also suggested as a means of avoiding construction in the Fort Point Channel. This option was rejected based on an analysis of the traffic impacts which would occur from improving Central Artery capacity north of the Dewey Square Tunnel without increasing capacity in the tunnel. Demand in the Dewey Square Tunnel would exceed capacity by 25 percent during peak hours, and by 10-15 percent in the hours immediately before and after the peak. Significant queuing would result, and traffic flows would be disrupted throughout the Central Artery and on local streets in downtown Boston and South Boston due to substantial traffic diversion from the Central Artery.

Again, a new Dorchester Avenue would have been required with this option. As with the Atlantic Avenue Tunnel concept, the only way to avoid construction of relocated Dorchester Avenue in the Fort Point Channel would be to displace the South Postal Annex which is unacceptable. Because of the poor traffic operating conditions and these impacts, this concept was rejected.

A Dorchester Avenue tunnel alignment was also evaluated. This option involved construction of the northbound Central Artery tunnel beneath existing Dorchester Avenue. This alignment could not be built without significantly disrupting operations of the South Postal Annex, which requires Dorchester Avenue for truck access and maneuvering space. Even if the South Postal Annex could operate during construction of the tunnel beneath existing Dorchester Avenue, the conversion of this surface roadway to public use is unacceptable as it would displace the Annex. Therefore, as with the Atlantic Avenue Tunnel, a relocated Dorchester Avenue would be constructed on piles in the Fort Point Channel. This concept was rejected because of the severe impacts it would cause to the South Postal Annex, and because it does not provide benefits over the Preferred Alternative's alignment in this area.

2.3.5 Pre-EIS Studies

Over the years, there have been considerable studies undertaken to evaluate the need and alternatives for improving the traffic operating conditions on the highway facilities in and through the City of Boston. Many options were considered prior to and during the Corridor Planning Study which led to the present Environmental Impact Statement. The following briefly identifies the options previously considered and rejected.

Inner Belt

The Inner Belt concept was originally proposed in the 1948 Master Plan for Highways in the Boston Metropolitan Area. The Master Plan was adopted as a basis for long-range improvement to area highways by the Commonwealth of Massachusetts. The Central Artery was a portion of the Inner Belt under this plan. To complete the plan, a series of 30 alternatives were studied, and of these, 10 were examined in detail. However, in 1971 Governor Sargent decided not to proceed further with the plans for the Inner Belt for these major reasons:

- o Extensive residential takings in Cambridge and Somerville;
- o Major disruption to communities and neighborhoods along the proposed corridors;
- o Community protest of all aspects of the Inner Belt;
- o Technical questions regarding the ability of the connecting radial highways and the Central Artery to accommodate projected traffic volumes; and
- o Generation of additional traffic for the core area of Boston.

Outer Harbor Crossings

Outer Harbor Crossings to serve as a link between Route 1A and the Southeast Expressway area were considered in the early 1930s and later in the Boston Transportation Planning Review (BTPR) in 1972. This concept used the Boston Harbor islands with a combination of bridges and surface facilities; a tunnel for portions of the crossing was also considered. Clearance requirements of a bridge over the major shipping channel in the Harbor created a hazard for Logan Airport flight clearance standards. This alternative, while serving bypass traffic well, was rejected since it did not provide connections among other facilities serving the region, nor did it provide adequately for downtown collection and distribution.

Access to the Airport was also constrained because of interchange requirements in the East Boston residential or open space areas.

Chelsea-East Boston Bypass

The Chelsea-East Boston Bypass was investigated in 1971, linking Route 1 on the north, through Chelsea to East Boston and the Airport, and under Boston Harbor to the Massachusetts Turnpike/Central Artery/Southeast Expressway area. It was conceived as part of the Interstate Route 95 project through Lynn, Revere and Boston, to permit access to the Airport and around the Boston CBD. Because of strong community objections, its dependence on the Interstate Route 95 project, substantial residential displacements, and other technical reasons, this concept was rejected from further consideration.

Pier-Tip Bypass

A Pier-Tip Bypass linking the Interstate Route 93 and Mystic-Tobin Bridge area to the north and Massachusetts Turnpike/Central Artery/Southeast Expressway area to the south by way of a tunnel along the outer tips of piers on the downtown side of the harbor was also considered. This alternative had several advantages, but was rejected because it could not provide connections to the existing tunnels, did not address access between expressways and either the downtown area or the Airport, and presented significant engineering and environmental issues.

A similar concept was reexamined as part of this FEIS/FEIR. The Pier-Tip Bypass Tunnel could not pass over the existing Callahan/Sumner Tunnels and the MBTA Blue Line Tunnel, as it would not allow adequate water depth in the main Boston Harbor shipping channels at low tide (only about 10 feet of water would remain when a minimum of 35 feet is required). If the Tunnel skirted the tips of the existing piers in Boston, it would have severe ecological effects on the Harbor's water quality and marine resources. It would also present both navigation problems/hazards, as well as safety problems for motorists in the tunnel, if it were to be struck by a large vessel (such as a tanker). The New England Aquarium and lobster companies in this area (Bay State, Hook, etc.) would also experience severe water-related impacts, as their deep intake pipes which draw in cool water for their holding tanks would be blocked. Passing under the existing Harbor tunnels would not permit reconnection to Interstate Route 93 near Route 1 because of the vertical transition (approximately 230 feet) required in a horizontal distance of less than one mile, and could cause severe, damaging settlements of these tunnels. This additional analysis has reconfirmed the previous decision to reject this concept because of the severe engineering problems and environmental impacts.

Cross-Boston Tunnel

In 1974, a deep-bore Cross-Boston Tunnel was suggested to connect the Interstate Route 93/Mystic-Tobin Bridge in the north with the Massachusetts Turnpike/Central Artery/Southeast Expressway in the south. This would be the shortest possible connection between these two points, although a tunnel connecting to the Callahan/Sumner Tunnels from the north under the existing Central Artery was also to be provided; the Central Artery would subsequently be removed. A number of reasons were cited for its rejection, including questions of technical feasibility to provide clearances over the Charles River without a massive, multi-tiered interchange in the North Station area, as well as its inability to serve traffic needs as a collector-distributor roadway for downtown.

Massachusetts Turnpike Authority Feasibility Study

In 1968, the Massachusetts Turnpike Authority (MTA) studied the

feasibility of a Third Harbor Tunnel to the Airport area. Six alternative alignments were considered, including a tunnel parallel to the existing tunnels; viaduct and tunnel combinations along the easterly side of the Fort Point Channel to the railroad area of East Boston; viaduct and tunnel connections from the Massachusetts Turnpike and Southeast Expressway, through South Boston and between Piers 2 and 4 to the East Boston piers and Massport property at the Airport; and various combinations of these alignments. The MTA recommended a viaduct to be constructed along the easterly side of the Fort Point Channel transitioning into a tunnel near the mouth of the Channel and emerging in the Conrail railroad right-of-way in East Boston with connections to the Airport roadway system.

The Boston Transportation Planning Review

Early in 1970, Governor Sargent halted work on a number of controversial highway projects in the Boston area and established the Boston Transportation Planning Review (BTPR) to review the transportation needs of the region and develop a balanced program of improvements which address those needs. This balanced program considered alternatives to highway construction, including increased reliance on public transit facilities, changes in parking policies in the downtown area, air travel improvements, etc. As a result of the BTPR, construction of several major transit system projects were recommended, including the MBTA's Red Line Northwest Extension and the Southwest Corridor Projects, both currently under construction; commuter rail system upgrading; and other public transit system improvements. Recognizing the limitations of public transit systems and the excess demand for access to the Airport, construction of a special use tunnel to the Airport to serve high occupancy vehicles such as buses, limousines, and taxis was also recommended. The need for major Central Artery improvements, including improved connections to the existing tunnels, and the potential benefits of depressing the Central Artery, was also recognized at that time.

Corridor Planning Studies, 1974-1980

In 1974, the MDPW evaluated the feasibility of depressing the Central Artery (Interstate Route 93) as a means to alleviate Boston's downtown traffic problems. Three separate Corridor Planning Studies (CPS) for reconstruction of the Central Artery in the North, Central, and South Area were performed between 1976 and 1978 by the Commonwealth of Massachusetts' Central Transportation Planning Staff (CTPS). The North Area project progressed from the CPS, through the EIS phase, and into the design stage. The Central and South Area CPS were completed in August 1978.

Subsequent to that date, a new CPS was conducted in 1980 which combined evaluations of a reconstructed Central Artery and Third Harbor Tunnel options. The CPS considered improvements in the South Area, the Central Area, and the Harbo Crossing. Various combinations of improvements in each of these areas yielded 13 alternatives for evaluation. The specific details of each improvement are described in the CPS. Briefly, these alternatives were:

CPS Alternative 1. No-Build. This alternative replaced the deck of the existing Central Artery with no increase in capacity. Cross-harbor capacity would not be increased over existing conditions.

CPS Alternative 2. Harbor Tunnel: One-Way Fort Point Channel; East Boston Railroad Alignment. This alternative converted the Dewey Squar Tunnel to one-way southbound operation, and all northbound Central Artery traffic was carried in a one-way tunnel in the Fort Point Channel reconnecting to the existing Artery in the vicinity of Atlantic

Square Tunnel, widening and redecking of the existing Central Artery viaduct, and construction of the Leverett Circle connectors to Interstate Route 93/Route 1 were provided.

CPS Alternative 11. Artery Depressed: New Tunnels Parallel to Dewey Square Tunnel; New Artery Tunnels. This alternative provided major improvement to the Central Artery by construction of new tunnels parallel to the Dewey Square Tunnel; widening and depressing the Central Artery north of Dewey Square; construction of two new bridges over the Charles River; provision of the Leverett Circle connector; and grade separation of the connections to/from the Callahan and Sumner Tunnels. No cross-harbor capacity was added.

CPS Alternative 12. Full Build: Harbor Tunnel and Artery Improvements. Eight combinations of major improvements to the Central Artery and a Third Harbor Tunnel were considered with this option. It combined an eight-lane Central Artery (depressed tunnel or widened viaduct) with a Third Harbor Tunnel (Railroad or Airport alignments); in the South Area, it considered the options of constructing a new Fort Point Channel tunnel or new tunnels parallel to the Dewey Square Tunnel.

CPS Alternative 13. Special Purpose Harbor Tunnel: Two-Way Fort Point Channel; East Boston Airport Alignment. A two-way, two-lane Fort Point Channel Tunnel and Third Harbor Tunnel to the Bird Island Flats area and Logan Airport would serve special purpose vehicles such as buses, limousines, taxis, emergency vehicles, large trucks, and possibly carpools. There would be no direct connections to Route 1A. Replacement of the Central Artery deck would also be provided.

The CPS concluded that major traffic benefits could be attained if capacity could be increased along the Central Artery, and recommended that a full-build option (new tunnel, and increased Artery capacity) be taken into the EIS. After the publication of the CPS, a decision was made to focus EIS attention only on the cross-harbor tunnel alternatives. The five alternatives in the DEIS/DEIR were then developed and evaluated, addressing the cross-harbor component of the region's traffic demand.

In addition to these highway alternatives, 11 transit options were also considered in the 1980 CPS:

1. Bus Loop at Airport - Existing Service.
2. People-Mover Loop at Airport.
3. Monorail Loop at Airport.
4. Blue Line Extension Loop at Airport.
5. Blue Line Extension to Sub-Terminal at Airport.
6. Blue Line Extension - Downtown.
7. Commuter Rail Extension between South Station and Airport.
8. Commuter Rail Extension between North Station and Airport.
9. Commuter Rail Extension to Blue Line - North Station/South Station Connection.
10. Circumferential Transit.
11. Ferry Boat to Airport - On-Board buses, Taxis and Limousines.

The Blue Line options were rejected as an alternative to the highway improvement alternatives after examination of their ridership potential. In all strategies, however, the Blue Line played an important role as a component element in a total ground access strategy. A Blue Line spur extension into the Airport, coupled with a Blue Line extension to either Charles or Park Street Stations in Boston, was also modeled as a separate

study as part of the traffic forecasting process for this FEIS/FEIR (see Section 4.2.8 and Appendix 3 - TRAFFIC). It was concluded that the Blue Line's present role of carrying six percent of Airport traffic could be increased to about nine percent by this investment. Similar findings were revealed for people-movers which have about the same transportation travel time characteristics as the present Massport bus system at the Airport.

The Commonwealth has also undertaken considerable study of the potential of water transportation in the harbor, including the 1977 EOTC Commuter Boat Report and the CPS studies. These studies have concluded that there may be a market from certain selected coastal areas, such as Hingham, for ferry service to the Airport. For most of the market, however, traditional ferry service would require several modal transfers. This level of service would be similar to, if not worse than, current use of the Blue Line.

During the EIS process, the concept of a bus-carrying ferry from South Boston to an Airport landing area for peak hour service was also considered. This concept has certain disadvantages. Because of the time needed to board and secure the buses and then to disembark the buses, the slower travel time across the water, and the need to operate on a fixed headway (e.g., every 10 to 15 minutes), this option would have longer total travel times than other possible solutions (e.g., giving buses priority access into a free flowing four-lane tunnel facility). In some hours of the day, the ferry option would have longer travel times than using the existing Central Artery and the Callahan tunnel.

As a result of these analyses, it was concluded that the demand for cross-harbor transportation service could not be adequately met by transit improvements alone. It was recognized, however, that transit improvements could supplement the service provide[d] by the highway connections in the area. Provisions for improved bus transit service across the harbor ha[ve] subsequently been included in the Preferred Alternative.

2.4 REASONS FOR NOT SELECTING OTH[ER] EIS ALTERNATIVES

This section summarizes the reasons for the Commonwealth's decision not to select other EIS alternatives described in Section 2.[3] ALTERNATIVES CONSIDERED IN THE EIS PROCESS of this FEIS/FEIR.

The transportation policy objectives of the Commonwealth have evolved as a comprehensive approach designed to solve the local as well [as] regional transportation problems of the Boston area's core highway facilities. The environmental process beg[an] after the completion of the Boston Transportation Planning Review in 19[7?] and has demonstrated that a comprehensive solution to these problems requires resolution of:

1) The north-south bottleneck; i.e., the Central Artery, particular[ly] from the Interstate Route 93/Route 1 interchange to the access to the Callahan/Sumner Tunnels;

2) The east-west problem of cross-harbor access to the Airport; and,

3) Providing Seaport Access to South Boston from regional expresswa[ys] while diverting regional flows of ca[rs] and trucks away from local streets.

While differences of opinion about how to achieve these ends were expressed during the public participation process and at the Public Hearing, very strong support was voiced for addressing all three of the area['s] transportation and highway problems. The Preferred Alternative does addres[s] all three of these transportation objectives.

The Two-Lane Tunnel Concept, while providing increased north-south capacity on the Central Artery and improved Seaport access from the regional expressways, does not resolve the east-west capacity problem since it provides only half the cross-harbor capacity of the Preferred Alternative. It was not selected for several reasons. After significant examination of this concept during the EIS/EIR process, the Commonwealth concluded that transportation (i.e., traffic) benefits of implementing the full Alternative 5A Modified program outweighed the initial construction savings involved in this concept. Specifically, the traffic analysis showed that before the design year (year 2010), the Two-Lane Tunnel Concept would have serious congestion problems, and thereby fail to relieve problems on the alternative routes (Callahan/Sumner Tunnels, Mystic-Tobin Bridge). In addition, the four-lane tunnel, as proposed in the Preferred Alternative, provides certain highly desirable traffic carrying roles during the construction of the widened and depressed Artery, and its reconstructed interchange with the Sumner and Callahan Tunnels. However, the Two-Lane Tunnel Concept would not preclude construction of two additional cross-harbor travel lanes.

In terms of highway safety and capacity, the Two-Lane Tunnel Concept is inferior to the Preferred Alternative, due to the two directional traffic in a head-on configuration in the tunnel, with no breakdown or by-pass capability in the case of an emergency. Traffic operations are also inferior to the Preferred Alternative. In terms of "user benefit", the Two-Lane Tunnel Concept would save approximately 7.3 million person hours per year less than a similarly designed four-lane cross-harbor tunnel.

Alternative 6, which solves only the north-south Central Artery capacity problem, is less desirable than the Preferred Alternative since it does not improve Seaport access nor does it increase cross-harbor capacity. Alternative 6 thus was not selected. Because no additional cross-harbor capacity is provided in this alternative, highly critical links of the Central Artery, such as the northbound segment immediately south of the Callahan Tunnel, do not realize a level of improvement similar to the Preferred Alternative. Congestion in the existing harbor crossings is also not relieved, and traffic volumes on local streets (particularly in South Boston) are not as low as with the Preferred Alternative. In addition, design and construction complexity in this area because of additional tunnel connector ramps to and from the south has more serious implications for both construction staging and ultimate parcelization, when compared with the Preferred Alternative. Finally, and significantly, the opportunity to provide major improvements to public transportation service to Logan Airport from the South Station Transportation Center (and for other bus and limousine services) is not realized in this alternative.

Construction of Alternative 6, while not accommodating all three transportation objectives of the Preferred Alternative, does not preclude construction of a Seaport Access Tunnel.

The widening and depression of the Central Artery creates the smallest increase of VMT of any of the alternatives tested. Construction of an "Artery Only" alternative would be most consistent with Commonwealth policy towards VMT minimization.

Alternative 5A fails to provide the total package of desired Seaport Access improvements, although it does address the major north-south and east-west transportation needs of the area. It also results in additional Section 4(f) impacts (at Bird Island Flats Park) and impacts in recreational boating and navigation at Jeffries Cove, as compared to the Preferred Alternative. Alternative 5A does not provide the necessary im-

proved access to the CBD area from the south afforded by a new, relocated Dorchester Avenue to Congress Street, nor does it provide the desired second interchange with Summer Street in South Boston. Both elements are essential to maximize savings in vehicle hours of travel. As a result, Alternative 5A was also rejected in favor of the Preferred Alternative which includes most features of this rejected alternative.

Alternative 3A addresses the critical north-south and east-west capacity problems of the area, but does not provide the desired quality of access to the Seaport area afforded by the Preferred Alternative.

Also, investment now in a third harbor tunnel crossing in the Alternative 3A configuration would make the later construction of an Interstate-scale Seaport Access alignment, with its complicated interchange requirements in South bay, uneconomical because it would result in two parallel expressway systems in the same general corridor. Alternative 3A also has impacts at Jeffries Cove and Bird Island Flats Park in East Boston which are similar to those in Alternative 5A. Alternative 3A includes a toll plaza and ventilation building near Jeffries Cove which are strongly opposed by the East Boston community; an at-grade ring road surrounding the East Boston Memorial Stadium, which has permanent Section 4(f) impacts; and has significantly greater adverse visual, historic, noise, and recreational impacts in the Fort Point Channel due to the required ramping system at Summer Street. During the public input process, major objections were raised to the Alternative 3A alignment. This alternative was subsequently rejected by the Commonwealth.

Alternative 3 does not address the Central Artery capacity problems (north-south), nor does it provide a solution for the South Boston Seaport Access problem. Construction of a Third Harbor Tunnel in the Alternative 3 configuration through the Fort Point Channel would make the later construction of a parallel expressway-scale Seaport Access roadway in the same corridor uneconomical, and would preclude construction that would address all three of the transportation objectives of the Preferred Alternative.

Alternative 3 has more undesirable design features at Porzio Park, Bird Island Flats Park, East Boston Memorial Stadium, and in the Jeffries Cove recreation area than the Preferred Alternative. It also has a much greater impact on the historic Fort Point Channel than the Preferred Alternative, due to proposed ramp construction from Summer Street. Alternative 3, as in all tunnel-only alternatives and the No-Build Alternative, also requires redecking of the existing Central Artery viaduct. The process of deck replacement would last about three years. In some cases, six lanes of temporary roadway can be provided by the use of six temporary 11-foot construction by-pass lanes. In other areas, such as the critical High-Level Bridge area north of Causeway Street, a reduced number of lanes will be necessary, resulting in severe worsening of the already bad traffic conditions. By contrast, the process of depressing the Central Artery will allow all six lanes on the existing viaduct to remain in operation.

In terms of vehicle hours of travel, Alternative 3 shows the smallest improvement of the options tested during the EIS/EIR process. In terms of user benefits, this alternative provides less than one-half of the person hours of travel savings produced by the Preferred Alternative. In terms of VMT, Alternative 3 would increase regional miles of travel by 21 million miles per year as compared with 18 million miles per year with the Preferred Alternative. This option is less effective than the Preferred Alternative at minimizing the use of local streets to gain access to the Airport particularly

from the north through the streets of Chelsea and East Boston. Alternative 3 was therefore rejected.

Alternative 5 does not address Central Artery bottlenecks, does not contribute to solving the Seaport Access problem, and would preclude construction that would address all three of the transportation objectives of the Preferred Alternative. As in the case of Alternative 5, this alternative also has adverse impacts on the Jeffries Point residential community in East Boston and major Section 4(f) impacts on Porzio Park, Bird Island Flats Park, and the East Boston Memorial Stadium. The environmental cost of the double ramp system in the Fort Point Channel at Summer Street creates severe aesthetic, historic and Section 4(f) impacts, and is totally unacceptable to the Commonwealth. The Central Artery would also have to be redecked with significant impacts on regional traffic flow during its construction.

In terms of "user benefit", Alternative 5 produces approximately 9 million person-hours per year of travel time savings -- slightly more than half of the Preferred Alternative. In terms of minimizing VMT, Alternative 5 generates a greater VMT increase than does the Preferred Alternative. Alternative 5 was also rejected.

Alternative 2, which followed the Railroad Alignment through East Boston, was rejected by the Commonwealth in March 1983 because of its potential impacts on the residential areas surrounding the proposed toll plaza areas on Bremen Street in East Boston, and vehement opposition by the East Boston community (neighborhood disruption, traffic, noise, perceived air impacts, etc.).

Alternative 4 would also have bisected the East Boston community (like Alternative 2) and was similarly rejected from further consideration by the Commonwealth in March 1983. Alternative 4 has even more severe environmental and historical impacts in the Fort Point Channel, where it used the same two-ramp design as Alternative 5. The combination of the environmentally damaging Fort Point Channel features with the rejected East Boston railroad alignment makes this option the least acceptable of the build alternatives.

The No-Build Alternative, which involves redecking the Central Artery, does not solve any of the critical transportation problems identified during the EIS/EIR process.

In terms of benefits gained by the user, the No-Build Alternative means that motorists would spend 17.6 million more hours per year in their vehicles than in the Preferred Alternative. In terms of traffic congestion, the No-Build Alternative means between 10 and 14 hours per day of LOS F conditions, which may have serious negative consequences on expected economic growth in the CBD area.

In terms of air pollution, the No-Build Alternative results in a net increase in the region's carbon monoxide and non-methane hydrocarbons, when compared with the Preferred Alternative.

The No-Build Alternative also fails to create approximately 20 new acres of prime downtown land from the present wasted condition -- land which could be used for housing, parks, recreation, or for commercial use with the Preferred Alternative. Visual characteristics of the downtown area, now blighted by the existing Central Artery, would not be improved by the No-Build Alternative.

The No-Build Alternative fails to improve the quality of local residential neighborhoods, resulting in tens of thousands of additional vehicles on local streets such as Commercial Street in the North End, Kneeland Street through Chinatown, Charles Street through Beacon Hill, and East Berkeley Street and Massachusetts Avenue in the South End, as

compared to the Preferred Alternative. The No-Build Alternative fails to solve the problems of regional use of neighborhood streets, as drivers seeking to avoid the congestion of the Callahan/Sumner tunnels rely increasingly on local residential streets. The No-Build Alternative also fails to provide the infrastructure required to make a program of direct service for buses, limousines, and special purpose vehicles possible; in the No-Build Alternative, no new right-of-way is created and all highway dependent transit remains competing with other congested traffic.

The No-Build Alternative also has significant construction period impacts on transportation to and through the CBD due to the reduction of capacity caused by the redecking procedure. Most significantly, the redecking through the double-decked High-Level Bridge area north of Causeway Street allows only two lanes of traffic to move through the construction area in each direction, causing serious bottlenecks and delays. This, in turn, would cause motorists to seek alternative routes to enter or exit the city, creating significantly increased traffic congestion on local streets in the area. The increased congestion would consequently increase air pollution, noise, and accident potential in these areas. By comparison, the Preferred Alternative allows six lanes of traffic to flow on the Central Artery viaduct while the process of depressing the facility continues below. Regional traffic flow is therefore maintained. With the Preferred Alternative, disruption of local traffic movements on the surface streets will be minimized by a number of measures, including a temporary six-lane roadway replacing portions of the Surface Artery and Atlantic Avenue; a construction haul road to separate construction vehicles from general traffic; and other traffic management techniques.

The No-Build Alternative has therefore been rejected.

2.5 DESIGN CONSIDERATIONS FOR THE PREFERRED ALTERNATIVE

Decisions relating to design parameters and construction methods for the Preferred Alternative were based on several factors, primarily design criteria established by the American Association of State Highwa and Transportation Officials (AASHTO and the Massachusetts Department of Public Works (MDPW). Other factors considered included costs; engineeri feasibility; compatibility with othe projects; design standards adopted b other projects of similar construction; minimization of environmental impacts; and public input from State Regional and City agencies, communit groups, businesses, and private individuals during the public review period. The modifications to Altern tive 5A resulting from this addition input have resulted in a project whi more effectively serves the transpor tation needs of the area.

2.5.1 Derivation of the Preferred Alternative

As discussed briefly in Secti 2.2 PREFERRED ALTERNATIVE, the Preferred Alternative includes a number of design features which were incorporated as a direct result of t inputs received during the public review period for the SDEIS/SDEIR. The following discusses the specific of these features.

Herald Street Extension

All build alternatives in the DEIS/DEIR and SDEIS/SDEIR channeled southbound traffic from the new tunn facilities to exit via a ramp to Albany Street in the South End. Fro this exit, most of the traffic would use East Berkeley Street for destinations in the Back Bay and South End areas. To eliminate this intrusion into the neighborhood, the Preferred Alternative incorporates a ramping system which terminates at the new Herald Street Extension on the easte ly side of the Central Artery. Exiting traffic will then use Herald

Street Extension and the widened Herald Street to travel to westbound destinations. As a separate project, the City of Boston is expected to widen and reconstruct existing Herald Street to serve this arterial function.

Bus/High Occupancy Vehicle Lanes

The Preferred Alternative has been modified in direct response to comments received from several groups, including the MAPC and the Greater Boston Chamber of Commerce, to include direct bus connections from the proposed highway facilities to the South Station Transportation Center (SSTC). The reconstruction of highway facilities in this area allows for creation of a "bus highway" on Interstate Route 93 from south of the Massachusetts Avenue interchange to the SSTC; this roadway will also be used by eastbound buses traveling from South Station to Logan Airport. Addition of the bus lanes to the design of the Preferred Alternative is consistent with the Commonwealth's transportation policies, including the provision of priority access for transit service to the Airport.

Fort Point Channel Design Refinements

The design of the Preferred Alternative in the Fort Point Channel area has been refined considerably since the SDEIS/SDEIR to mitigate adverse impacts on the Channel. In particular, an extensive coordination and design refinement effort has occurred which resulted in minimizing historic, Section 4(f), aesthetic, and water-related impacts on the Fort Point Channel. The refinements include: lowering the tunnel profile to minimize water displacement; moving the relocated bulkhead line to the west of the previously proposed location north of Congress Street; removal of a ramp in the Channel from the northbound Central Artery to relocated Dorchester Avenue; and redesign of relocated Dorchester Avenue to a one-way (northbound), two-lane roadway along the length of the South Postal Annex. Many of these design refinements are feasible because of the Seaport Access alignment tunnel, which significantly improves access to the South Boston area, and because of the design of the Herald Street Extension improvements.

Seaport Access Alignment

The Seaport Access alignment was developed with input from civic leaders in the South Boston community. The Preferred Alternative includes a direct connection from Summer Street to better serve the major truck activity center (Castle Island, White Fuel, the Army Base, and Boston Marine Industrial Park). The new interchange improves connections to the south and west, but does not allow direct connections to the Airport from Summer Street.

Dewey Square/Chinatown Area

Reduced access to the downtown retail area of Boston, common with all SDEIS/SDEIR alternatives, prompted many business representatives to request further evaluation of the project in the Dewey Square/Chinatown area. The Preferred Alternative incorporates a new southbound ramp from Purchase Street (in the area of the existing, abandoned northbound Lincoln Street ramp), and a Central Artery northbound ramp at South Street, through the Dewey Square tunnel. These "scissors" ramps effectively remove more than 27,000 vehicles per day from the local streets.

Other design refinements in this area are also included in the Preferred Alternative to reinforce the City's surface roadway improvements (TSM project) proposed for this area, resulting in a major environmental improvement at the Chinatown Gate area.

Financial District/Waterfront

The new Central Artery northbound on-ramp at South Street also improves traffic operations for northbound traffic entering the

Central Artery via the Northern Avenue on-ramp. Redesign of the surface streets of the project in this area, including provisions for U-turns at Pearl Street and Clinton Street, have been incorporated into the Preferred Alternative to reduce the circuitous routing of traffic.

Haymarket/North End Area

Design refinements in this area include the redesigned off-ramp near North Street, a new ramp from North Street into the Callahan Tunnel, and the use of Traverse Street to improve the traffic flow at Haymarket Square. These improvements increase accessibility to the highway facilities while reducing traffic congestion on the surface streets. In addition, a construction-phase temporary on-ramp, to have been constructed along Cross Street, opposite Salem Street, has been relocated southward to North Street at the request of the local businesses in the area.

Charles River Area

The design presented for the Preferred Alternative incorporates a ramp not previously included, serving Central Artery northbound traffic exiting to Leverett Circle. The geometry of the new tunnel ramps in this area minimizes encroachment into the Charles River while providing for an improved pedestrian walkway along the River's bank. However, much additional work in this area is necessary, with extensive coordination with the BRA and the MDC, to resolve conflicts between the proposed highway connections and the conflicting plans of these agencies. With the present ramp alignment, construction in the Charles River could not be totally avoided without displacing the Spaulding Rehabilitation Hospital while tying in to Leverett Circle and Storrow Drive. However, design refinements now underway suggest that it may be possible to relocate these connector ramps away from both the Charles River and the Spaulding facility.

Logan Airport

Major design refinements to th Third Harbor Tunnel/Airport Roadway interchange are incorporated in the Preferred Alternative to: eliminate impacts in the Jeffries Cove/ Porzio Park area; avoid impacts to the proposed Bird Island Flats park; avoi permanent impacts to the East Boston Memorial Stadium; and to more closely conform to the long-term Master Plan for the Airport, including grade-separation of the access and egress roads from Cross Road. The major thrust of the refinements is to avoic or minimize impacts to the Section 4(f) properties, while significantly improving vehicular circulation at tl Airport.

2.5.2 Other Design Considerations

The following subsections summarize some of the considerations affecting the design of the Preferre(Alternative in the following geographic areas:

- o South Bay/Fort Point Channel Area;
- o South Boston/Seaport Area;
- o Harbor Crossing;
- o Central Area;
- o North of Causeway Street; and
- o East Boston/Logan Airport Are

South Bay/Fort Point Channel Area

Gillette Company Cooling Wate Requirements

As described in Derivation of the Preferred Alternative, design refinements have also been incorporated to accommodate the larg volumes of cooling water needed for manufacturing operations at the Gillette Company complex in South Boston. These refinements result in no change to the shoreline and water volume in the vicinity of the Gillet Company facilities. With respect to the Gillette Company facilities them selves, the primary refinement is th relocation of the cooling water inta and the discharge piping to mitigate potential thermal impacts.

It should be noted that during the Corridor Planning Study (CPS), locational considerations for tunnels in the Fort Point Channel and South Boston areas were specifically addressed. In particular, the CPS examined tunnel alignments suggested in BTPR which were to the east of the Fort Point Channel and took advantage of vacant or lightly developed land; these alignments included use of the Reserved Channel but also traversed densely developed residential areas enroute to the vacant lands. Because of the potential for significant adverse community impacts, the longer distances and resulting increased construction time and costs, these alignments were rejected in favor of use of the Fort Point Channel. Tunnel construction in the Fort Point Channel will occur in the westerly side of the Channel, since it offers the opportunity to preserve water use by land owners (Gillette) along the easterly side, and allows flexibility for connections to the improved Central Artery and the Third Harbor Tunnel.

Relocated Dorchester Avenue

A northbound relocated Dorchester Avenue is an integral part of the Third Harbor Tunnel project because it reduces local (South Boston/Fort Point Channel) traffic access and circulation problems.

By providing a ramp to relocated Dorchester Avenue from the Southeast Expressway/Central Artery, traffic which presently short-cuts via lower Dorchester Avenue, Broadway Bridge, L Street and other local South Boston streets to get to the northern sector of South Boston can remain on the Expressway/Artery and Frontage Road. The new, public Dorchester Avenue's connection at Summer Street improves access between South Boston and the downtown area by providing a direct connection and thus reduces the short-cutting through South Boston. This improvement in the northbound direction will further ease both through traffic and commercial traffic on local South Boston residential streets (see Section 4.2.2 TRAFFIC VOLUMES), since it confines this traffic to the Fort Point Channel/South Bay industrial corridor.

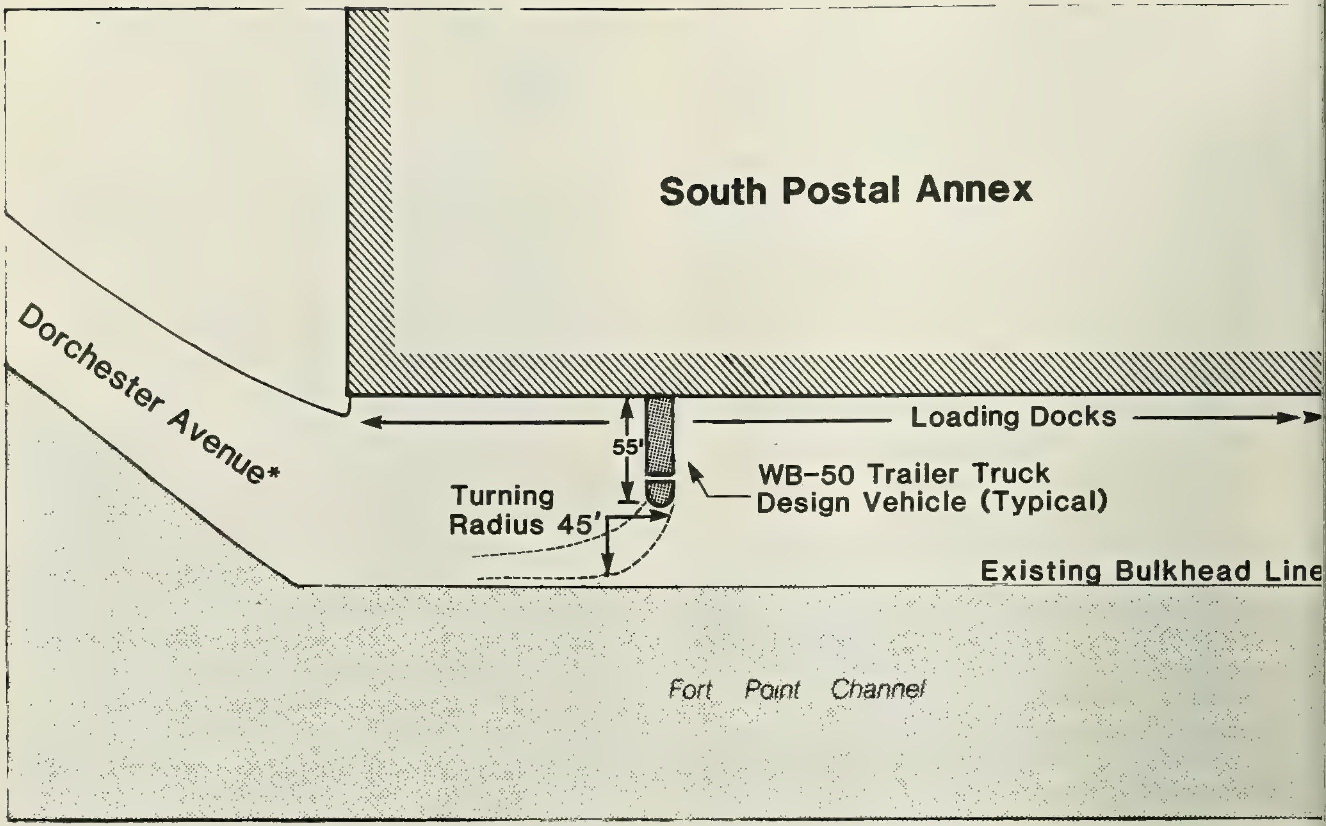
Finally, circulation and access between downtown Boston, South Boston, and the proposed tunnel requires increased roadway capacity parallel to Fort Point Channel which Atlantic Avenue in Boston and Sleeper and other streets in South Boston currently cannot provide.

The traffic analysis revealed that additional capacity was only needed northbound to Summer Street. Therefore, the new Dorchester Avenue has been reduced to a two-lane, one-way northbound connection to Summer Street; between Summer Street and Congress Street, the existing Dorchester Avenue will be reconstructed as a four-lane two-way roadway; and existing on-street angle parking will be removed and possibly replaced with parallel parking. This design change reduces encroachment into the Fort Point Channel.

Existing Dorchester Avenue south of Summer Street is owned and controlled by the South Postal Annex. According to the Postal Service, their operations require full use of this roadway for access and maneuvering of large tractor trailer trucks (for delivery and dispatch of mail from nearly 100 loading docks fronting the Fort Point Channel), as indicated in Figure 4. Attempts to use a portion of existing Dorchester Avenue for public use (relocated Dorchester Avenue), as presented in Figure 4, would interfere with Post Office operations, possibly resulting in displacement of the facility.

Central Artery Northbound Tunnel Crossing of MBTA Red Line Tunnel in Fort Point Channel

Two crossings of the MBTA Red Line twin tunnels in the Fort Point Channel are required with the Preferred Alternative (Central Artery



*Existing Dorchester Ave.–
Private Property

Figure 4
South Postal Annex– Use of Dorchester Avenue

0 50 100 Feet

EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Artery

northbound tunnel and Seaport Access tunnel). Two options for these crossings were considered, with crossing over the Red Line tunnels recommended. The highway tunnels will be supported on pile foundations on either side of the Red Line tunnels, allowing the highway tunnels to span the Red Line tunnels and avoid distributing loads onto the subway structure. Also, stress changes in the subway tunnel linings resulting from excavation can be maintained at tolerable levels, requiring limited structural strengthening of the Red Line tunnel.

Tunneling under the Red Line tunnels is not recommended. Bored tunneling would generate unavoidable and potentially damaging settlements of the overlying ground and Red Line tunnel. Also, desired horizontal clearances between bored tunnels would present highway alignment problems. Soil conditions, consisting of dense glacial till and bedrock, would add to the difficulties of bored tunneling. Cut-and-cover type tunneling below the Red Line tunnels would require underpinning of the tunnels, and is not considered feasible because of potentially significant transit service interruptions and impacts to the structural integrity of the Red Line tunnels (high risk of structural failure).

<u>Alternatives to Avoid the Fort Point Channel</u>

Other Third Harbor Tunnel alignments east and west of the Channel were considered and rejected in the Corridor Planning Study owing to unacceptable horizontal and vertical geometry, major property takings and displacements, and impacts on existing historic structures and districts. Because of the need to tie into the existing Massachusetts Turnpike interchange with the Central Artery, the Fort Point Channel can not be completely avoided while addressing the transportation needs of the area.

This issue was studied further in this FEIS/FEIR, both with respect to the Third Harbor Tunnel and the northbound depressed Central Artery tunnel alignments, as discussed both in Section 2.3.4 <u>OTHER CONCEPTS EXAMINED IN THE FEIS/FEIR</u>, and Section 5.2.3 <u>FORT POINT CHANNEL DISTRICT</u>.

<u>Toll Plazas - Boston</u>

A toll plaza location serving all of the roadway connections required between the new tunnel and the Massachusetts Turnpike, Southeast Expressway, Central Artery, and local streets was not possible in the South Bay area. In addition, the increased size of the construction area would severely constrain the operations of many of the railroad services (Amtrak, Conrail, MBTA Commuter Rail, MBTA Red Line, etc.) in this area.

Location of a toll plaza in East Boston was strongly opposed by the East Boston community because of traffic, air, and noise impacts, and its proximity to the Jeffries Point neighborhood. Further, the toll plaza at the Airport interfered with ongoing developments on Bird Island Flats. Because of the realignment of the tunnel through South Boston and Commonwealth Flats, adequate land area for a toll plaza exists on the South Boston side of the Harbor, and connections to the area's roadways can be accommodated in conformance with established design criteria for toll plazas. The plaza will be located in industrial and vacant Massport-owned lands, away from South Boston residential areas. Toll plazas in the South Bay and East Boston areas were eliminated from further consideration.

<u>Conrail Wye Connector</u>

The Wye Connector, recently constructed by the Massachusetts Bay Transportation Authority (MBTA) to allow freight and passenger train movements to occur while bypassing the South Station yards, will be affected by the Preferred Alternative. The connecting roadways from the Southeast Expressway and the Massachusetts

Turnpike to the Seaport Access Tunnel and depressed Central Artery will pass under the Wye Connector. A temporary rail line is proposed as part of the tunnel project to maintain service along the Wye Connector during construction of the pro posed connecting roadways, and the Herald Street Extension, which will pass over the Wye Connector. Similarly, temporary realignment of the Amtrak facilities through and across Fort Point Channel will also be included to maintain intercity rail service during construction.

Combined Sewer Overflow Facilities

The Metropolitan District Commission's proposed combined sewer overflow (CSO) treatment facility in the South Bay area is expected to be constructed after the Central Artery/ Third Harbor Tunnel project is completed. The Preferred Alternative has been developed to ensure that adequate space is provided to accommodate the CSO treatment facility.

A CSO pipeline is also proposed by the Boston Water and Sewer Commission from the vicinity of High Street in Boston to the treatment facility in South Bay. This pipeline can be located in either the Fort Point Channel or in existing Dorchester Avenue. Construction of the new Central Artery northbound tunnel will not preclude the future construction of this pipeline. Optional routings have been evaluated by BWSC, and they have selected use of Atlantic Avenue for the 96-inch pipeline to the treatment facility. Planning for the northbound Central Artery tunnel in Fort Point Channel has allowed for construction of the CSO pipeline above the tunnel (below relocated Dorchester Avenue).

Provisions for accommodating the existing outfalls into the Fort Point Channel will also be made in the design of the new Central Artery northbound tunnel.

South Boston/Seaport Area

Seaport Access Tunnel Profile

A viaduct option for this portion of the alignment was considered which consisted of a bridge structure over the Fort Point Channe including bridge connections to the Central Artery southbound, and formi a three-level structure at the junction of the Massachusetts Turnpike with the Central Artery. As the alignment approached and entered Boston Harbor, the profile had to be deep enough to allow passage below t 45-foot (future) main shipping channel. This grade differential (more than 150 feet) resulted in unacceptable operating conditions and speed reductions. The alignment also woul create severe aesthetic impacts on t Fort Point Channel Historic District and was subsequently rejected.

An at-grade alignment through South Boston was also considered. This profile would result in significant impacts to existing and propose development in this portion of South Boston, since it would sever development parcels and disrupt circulation on internal streets. For example, proposed redevelopment plans for the Boston Wharf Co. parcel between the Fort Point Channel and A Street coul not be realized with an at-grade alignment which traverses this parcel. An at-grade alignment could similarly constrain development plan on the southeastern portion of the large development parcel between Northern Avenue, Viaduct Street, Summer Street, and the service road linking the tunnel ramps with Northe Avenue, although not to the extent a with the Boston Wharf Co. parcel. T Preferred Alternative's profile through this area does constrain future building locations somewhat a creates premium costs for building foundations in certain areas, as indicated in Section 4.4 LAND USE IMPACTS, but does not inhibit the development plans for this area. Because of these impacts, this profi was also rejected.

The profile of the Preferred lternative minimizes impacts at the ort Point Channel crossing and rovides a high quality design for mproving access to and through the outh Boston industrial seaport area. t does not permanently alter existing oadway circulation patterns in this rea. This profile also allows access cross the highway alignment by ecking over the depressed highway at elected locations. This alternative lso allows (and enhances) future evelopment on remaining parcels in he area by covering the majority of he highway facilities in this area. he extent of decking should be inally determined during the design hase, when refinements to the design nd the tunnel ventilation system are erformed.

Hazardous Cargoes

In order to provide direct ccess from the Massachusetts Turnpike xtension and Southeast Expressway to outh Boston for trucks carrying azardous cargoes (including fuel oil rucks from the White Fuel/Castle sland Terminal area), uncovered ections of roadway have been provided n the South Bay area and the Fort oint Channel area. The openings limit the closed tunnel segments to pproximately 1400 feet long for this urpose. In addition to the spacing or openings in the tunnel, based on onversations with Boston Fire Department and South Boston representatives, he following will also be included in he Seaport Access tunnel design: eluge pumps (multi-fire sprinkler), automatic foamite dispenser system, refractory tiles, and appropriately-spaced emergency evacuation shafts. It has been assumed that approvals would be obtained for hazardous cargo vehicle use of this tunnel, because alternative routings would use inappropriate local streets, thus increasing the potential for serious accidents occurring on the alternative surface routing.

General Ship Drydock and Boston Marine Industrial Park

Tunnel alignments between Piers 1 and 5 were rejected because of unacceptable access connections to the waterfront area. The Preferred Alternative permits access to Congress Street and Northern Avenue, and provides improved access to Logan Airport, Boston's Financial District, and the South Boston seaport area. This alternative profile provides a minimum of 7 feet of clearance below the (future) 45-foot deep main shipping channel of Boston Harbor.

An alignment to the east of the Preferred Alternative, running through the rock fill dike of the BMIP land fill, was originally considered. It was eliminated due to the potential major adverse impacts on BMIP (displacing Buildings 17, 19, and 53) and the significant additional cost of removing and replacing the rock fill dike and providing a temporary sheet pile wall along the tunnel to contain the miscellaneous embankment material in the land fill.

Another alignment located in the land fill east of the rock dike, while desirable from an excavation standpoint, resulted in additional property taking problems and was also rejected. The buildings that would have been taken included the Leonard Silver Company Building #19; Building #53, a support facility for the General Ship Company; and Building #39, a power plant required for the General Ship Drydock. This alignment required a large portion of land from the Economic Development and Industrial Corporation (EDIC). The land is used for buildings, storage, and parking, and is not replaceable within the immediate area.

Harbor Crossing

Two profiles were investigated for the Third Harbor Tunnel crossing under Boston Harbor: a shallow, sunken tube (high profile) tunnel, and a deep bore tunnel (low profile). The sunken tube tunnel (either reinforced concrete or steel) will consist of two parallel roadways in a 28-foot high by 88- to 98-foot wide (approximately)

prefabricated structure. The tunnel will have a protective stone cover and the top of the structure will be at a minimum of 7 feet below the proposed 45-foot deep shipping channel in Boston Harbor.

The deep bore tunnel would consist of twin 38-foot diameter steel tubes with a minimum cover of one tube diameter. The deep bore tunnel is not feasible due to existing soil conditions; construction problems; and unacceptable highway design aspects, including significant speed reductions.

By comparison with bored tunnel methods for this project, the sunken tube method is significantly less complex. It also involves less risk of costly delays due to construction problems. Provisions for maintaining nearly continuous shipping and other navigation in Boston Harbor can be made with the sunken tube construction method.

It is conceivable that the tunnel could be constructed without having to close more than half of the 1200-foot shipping channel at any time. However, due to the precision required in placing (sinking) the tunnel sections and possible safety problems, the channel should be closed to navigation during this operation, which could be completed in approximately one day per tunnel section. There will be continued coordination of this construction process with the Coast Guard and the Harbormaster.

Tunnel Utilities

Tunnels for this alternative will contain no hazardous transmission mains or pipelines that could create a hazard to vehicle drivers in the event of a break or rupture. The tunnels will contain deluge pumps, water lines, and foamite dispensers for fire protection as well as drainage lines and other pumps. Lighting, ventilation, T.V. monitoring and communications facilities will be provided. The tunnel will have safety walks located on both sides of the roadways; emergency access points will be provided where appropriate, except for the Third Harbor Tunnel itself, where access will be from the mainline and ramp portals. Because of the additional property acquisition/displacement requirements, as well as additional environmental impacts and costs associated with provision of breakdown lanes in the new tunnels, breakdown lanes are not provided in the Central Artery or the Seaport Access/Third Harbor Tunnel.

Central Area

Split Surface Artery

The northbound and southbound surface arterial roadway was initially considered as a single roadway. However, in order to improve traffic operations at critical intersections and to create additional parcels of land for future development, a desire of the City of Boston, the northbound and southbound roadways were separated. Continuous circulation from Atlantic Avenue to Causeway Street is provided by the Preferred Alternative.

Central Artery-Alignment

In the Central Area, the Preferred Alternative was aligned to minimize land takings, underpinning impacts and demolition of buildings. Some of the design constraints along the Central Artery (see Figure 5), which are discussed in more detail in Chapter 3.0 of this report are: proposed Fort Hill development located on Purchase Street; BRA Parcel D-10 (Marketplace Center), located between State Street and Commercial Street; Quincy Market, located on Commercial Street and Clinton Street; the North End residential neighborhood and shopping area; the MBTA Orange Line Tunnel, located between New Chardon and Causeway Streets; the existing Dewey Square Tunnel; and the future corridor for the Purchase Street off-ramp. Avoiding these properties, while tying into the existing highway facilities at either end of the Central Artery corridor, essentially fixed the depressed Central Artery alignment.

While initially the conceptual design of the Central Artery southbound, in the vicinity of the historic Quincy Market area, had a proposed 1200-foot radius horizontal curve with two-foot wide safety walks on the right side. This alignment resulted in reduced horizontal sight distance. A four-foot walk was provided on the left side. As the alignment continued south and entered the Dewey Square tunnel, the horizontal radius would again reduce the drivers' sight distance. This condition occurred again towards the southerly end of the Dewey Square tunnel as the alignment curved to the left. Figure 6 presents the effect of designing the Central Artery in this area to meet the AASHTO standards and adequate stopping sight distance for a 50 mph design speed, when a continuous 1500-foot radius is provided. With this design, the following additional buildings would be affected:

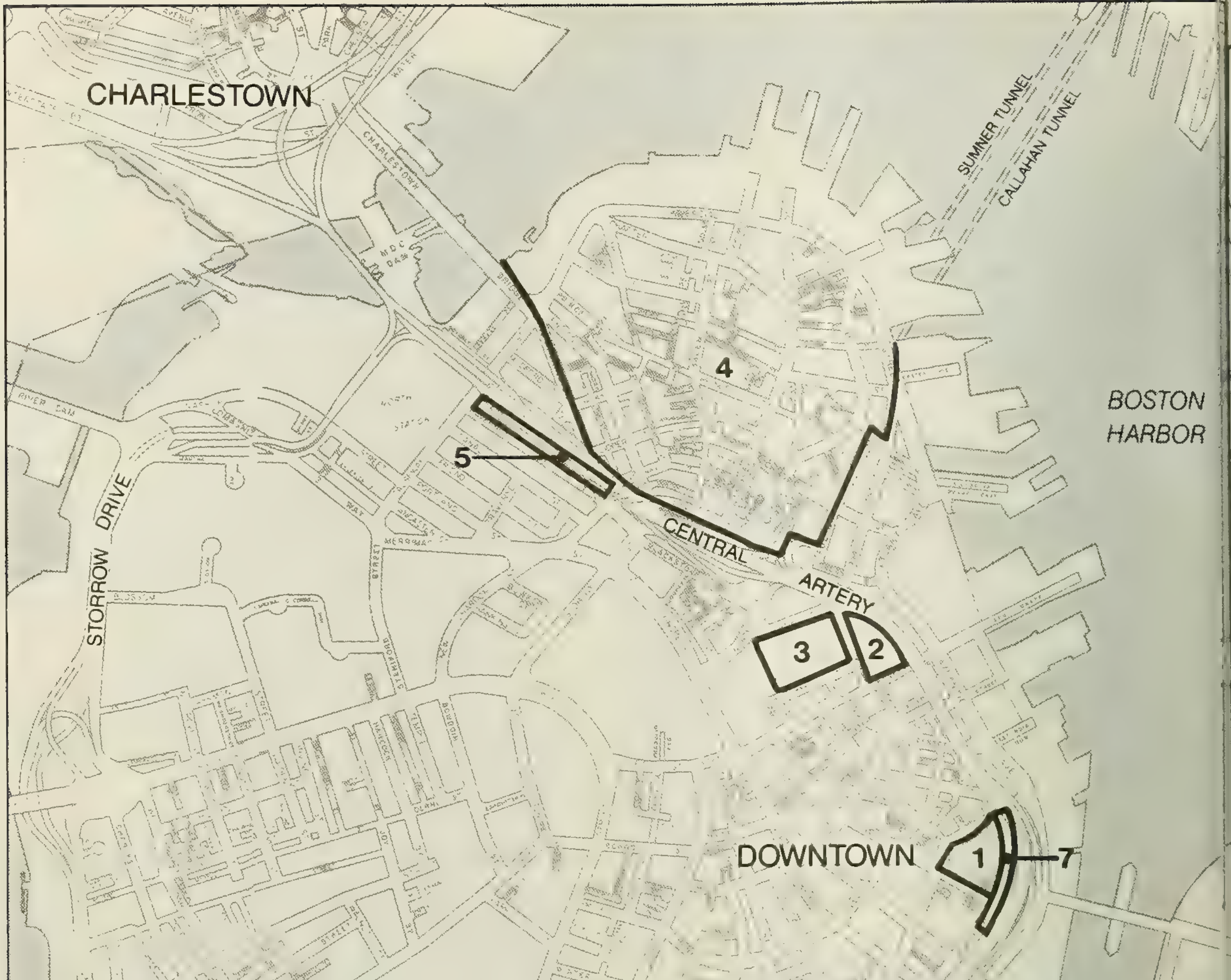
- o Marriot Long Wharf Hotel;
- o MBTA Blue Line Aquarium Station and emergency evacuation facilities;
- o New England Telephone Co. Building;
- o Harbor Towers Parking Garage; and
- o Harbor Towers.

Because of these potential displacements, this possible realignment has been rejected. However, ongoing design refinements at a larger engineering scale has allowed the proposed Central Artery alignment to be revised in the Quincy Market area such that a 50 mph design speed and adequate stopping sight distance can be achieved without displacing the buildings mentioned above. It will be the MDPW policy to provide sight distances which conform to AASHTO standards while maintaining existing and proposed development in this area.

AASHTO standards also establish a minimum vertical clearance of 16 feet 6 inches to obstructions above the roadway (such as to bridges, overhead signs, etc.). Because vertical clearances of the existing facilities are 14 feet 6 inches or less (Dewey Square Tunnel: 14'6"; Sumner and Callahan Tunnels: 13'8"; Massachusetts Turnpike Extension: 14'3"), the design of this project has a minimum vertical clearance of 14 feet 6 inches. The actual clearance to the tunnel ceilings has been set at 16 feet 6 inches, thus allowing overhead signs to be 2 feet high. During the design phase, if signs larger than two feet high are required, the roof of the tunnel box can be modified in the vicinity of the sign to allow for the increased height.

Central Artery-Profile

Consideration was given to a "high" profile crossing over the MBTA Blue Line tunnel at State Street and a "low" profile beneath it. The Blue Line tunnel is underlain by silty clays below which is glacial till. Tunneling within the soils below the tunnel poses substantial risk related to detrimental settlement of the subway tunnel structure. The problem is particularly severe given the width of the depressed Central Artery structure. Because of these potential risks, and the possibility of significant disruption to Blue Line transit service, a "high" profile over the Blue Line tunnel is proposed. In order to protect the Blue Line tunnel during construction of the Central Artery project, extensive and expensive measures must be taken. These measures are discussed in the Supportive Engineering Report in detail (Chapter 5.0). They include, among others: Blue Line Tunnel reinforcement; placement of piles on either side of the Blue Line tunnel and spanning over the tunnel with the Central Artery structures; and placement of granular cushion material between the structures.



1 Fort Hill Development Area
2 BRA Parcel D-10
3 Quincy Market
4 North End
5 MBTA Orange Line Tunnel
6 Dewey Square Tunnel
7 Purchase St. Off-ramp (proposed)

Figure 5
Properties Controlling Central Artery Alignment

0 550 1100 Feet

EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Artery

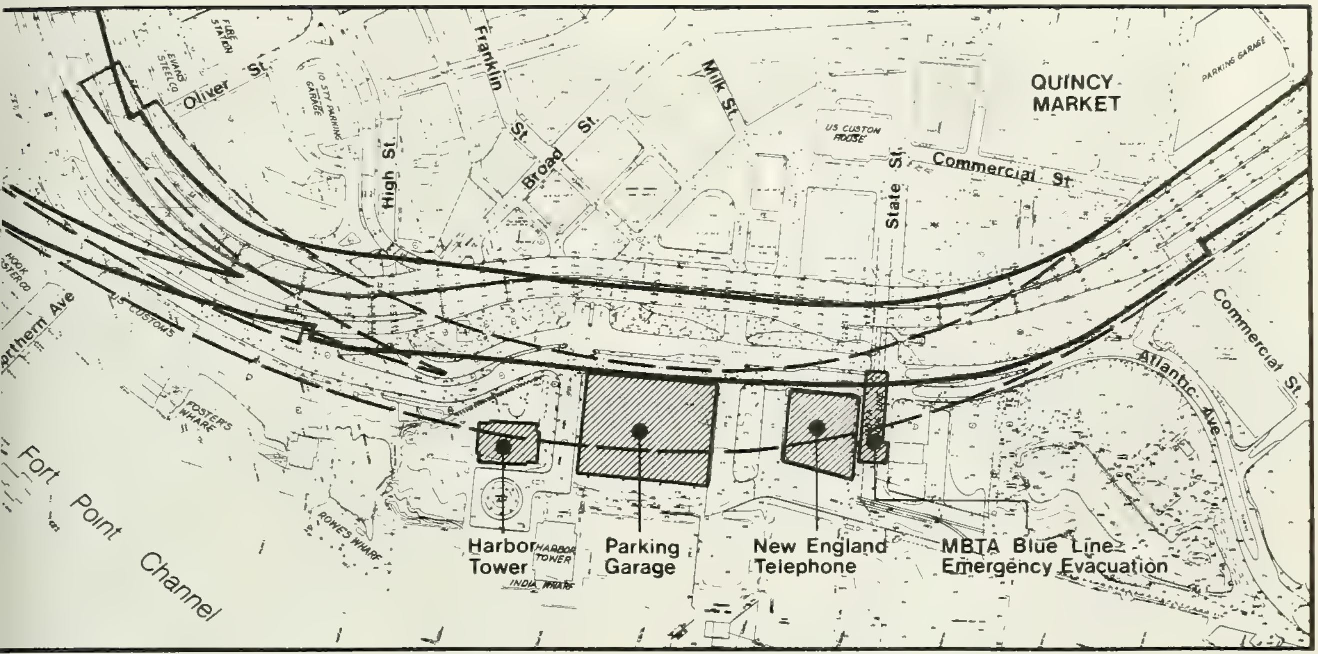


Figure 6

Effect of AASHTO Standards on Existing Development–Central Area

0 200 400 Feet

EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Artery

North of Causeway Street

Storrow Drive Ramps to and from the Depressed Central Artery

The existing ramp connections to and from Storrow Drive and the Central Artery are made through a double-decked viaduct ramp system, located to the north of Boston Garden and above the MBTA's commuter rail tracks at North Station. New connections from Storrow Drive to the southbound Central Artery, and from the northbound Central Artery to Storrow Drive, are proposed to cross under the MBTA tracks. Ramp grades would be excessive (9-10 percent) if overhead crossings were used.

Other alignments for these ramps were studied in the Nashua Street and the Spaulding Rehabilitation Hospital area. However, since the connection from Storrow Drive to the Central Artery southbound is proposed to take place at-grade from Leverett Circle in order to reduce the potential for increasing traffic on Storrow Drive and Back Bay residential streets, the location of the connectors was changed to the present location to achieve a more acceptable horizontal alignment and to be compatible with proposed MBTA Green Line relocation plans. Further refinement to the design will occur during later stages of the project to resolve conflicts with BRA and MDC plans for this area. It now appears that design modifications to be made during preliminary design to minimize impacts to the Charles River's edge may change this alignment.

Leverett Circle Connections to and from Mystic-Tobin Bridge and Interstate Route 93

Leverett Circle tunnel connections passing under the Charles River to and from the Mystic-Tobin Bridge and Interstate Route 93 in Charlestown were considered, as presented in the MDPW 1981 "Leverett Circle Connection - Feasibility Study." Those connections replaced the existing Leverett Circle rotary with a signalized "T" intersection; provided a direct connection between the Mystic-Tobin Bridge and Storrow Drive; and eliminated the weaving section on the High-Level Bridge. The Leverett Circle tunnel connections were opposed by residents of the West End and Back Bay because of the anticipated traffic increase on Storrow Drive (greater than 11 percent over future without the Leverett Circle Connections). Since Leverett Circle presently limits the amount of traffic which can pass through the area, replacement of this facility with improved tunnel connections would attract increased traffic volumes onto Storrow Drive and through the West End and Back Bay residential areas. These connectors also would result in permanent displacement of Section 4(f) parklands of the Charles River Basin, and because of the transverse crossing of the navigation channel, construction activities would severely disrupt navigation in the Charles River. These connections were subsequently rejected by the MDPW in favor of the ramps provided with the Preferred Alternative.

Ramps to Interstate Route 93 in Charlestown and the Mystic-Tobin Bridge were also studied in the same corridor as the proposed connector tunnels to the depressed Central Artery. This location would require a structurally infeasible long-span truss with a sharp horizontal curve over the Charles River. The requirement for a truss is to avoid placement of bridge piers in the navigation channel. This option was therefore rejected.

An option was also studied which placed the aforementioned ramps between the Spaulding Rehabilitation Hospital and Nashua Street, beginning as a tunnel near Leverett Circle, ascending and bridging over MBTA railroad tracks at North Station and joining the new bridges over the Charles River. This option produced unacceptable horizontal and vertical alignments (grades were approximately 10 percent). Because of the poor geometrics this option was rejected. It now appears that design modifications

to be made during preliminary design to minimize impacts to the Charles River's edge may change this alignment.

Causeway Street Off-Ramp

Access from the Central Artery southbound to Government Center is currently provided via a ramp to New Chardon Street near the Government Center Parking Garage.

Replacement of this ramp while avoiding residential displacements is not feasible because of insufficient width between the depressed Central Artery and the existing MBTA Orange Line tunnel. If this ramp were to be provided, approximately 10 residences and 3 businesses in the North End neighborhood would be displaced.

Central Artery-Profile

The profile of the Central Artery, as it emerges from the tunnel at Causeway Street, rises at a +6 percent gradient to cross over the shipping channel of the Charles River (with a minimum clearance of 30 feet). Although this profile grade is acceptable from a "design standards" perspective, the length of the grade results in speed reductions of approximately 37 mph. The Causeway Street on-ramp also merges with the northbound Central Artery traffic in this area, compounding the effect of the steep grade on operations. Further refinements to the profile of the Central Artery will be evaluated during the design stage to improve upon the operational aspects of this facility. Design modifications to be made during preliminary design will improve the grade from 6 percent to less than 5 percent.

East Boston/Logan Airport Area

Airport Alignment

The original Jeffries Cove options at Logan Airport curtailed existing boating and recreation activities and detracted from the Cove's aesthetic qualities during construction. It was also strongly opposed by the Jeffries Point residential community. Several other considerations also made the present alignment through Bird Island Flats (BIF) more desirable.

- The ventilation building will be placed furthest from the community, on the shoreline of BIF;
- Alignment avoids impact to the proposed BIF park, and eliminates permanent long-term impacts at East Boston Memorial Stadium.
- The toll plaza will not be located in East Boston or at the Airport.
- The alignment improves traffic movements at the Airport by allowing the Airport access and egress roads to pass under the Cross Road instead of intersecting at-grade.

3.0 AFFECTED ENVIRONMENT

3.1 TRANSPORTATION FACILITIES

3.1.1 Existing Roadway Characteristics

Affected Roadway Network

The affected roadway network is presented on Figure 7. The major facilities crossing the harbor include the Mystic-Tobin Bridge (U.S. Route 1) and the Callahan/Sumner Tunnels (State Route 1A), which serve communities north and northeast of Boston. Both the tunnels and the bridge connect with north-south Interstate Route 93, which includes both the Central Artery and the Southeast Expressway to the south. Interstate Route 90 (Massachusetts Turnpike) and Storrow Drive provide major east-west connections between the Central Artery and communities to the west. In addition to the major roadway network, traffic conditions on 54 existing highway links and 54 key at-grade intersections are identified and evaluated.

Hazardous Cargo Routes

Vehicles carrying hazardous cargoes are prohibited from using the Callahan and Sumner Tunnels, and the Dewey Square Tunnel portion of the Central Artery. Because of this restriction, a number of alternative routings for such vehicles exist. Vehicles carrying hazardous cargo between East Boston or Revere and Boston presently use the Mystic-Tobin Bridge instead of the Callahan and Sumner Tunnels to cross Boston Harbor. To avoid the Dewey Square Tunnel, these vehicles use surface streets such as High Street, Purchase Street, Atlantic Avenue, Surface Artery, and Kneeland Street.

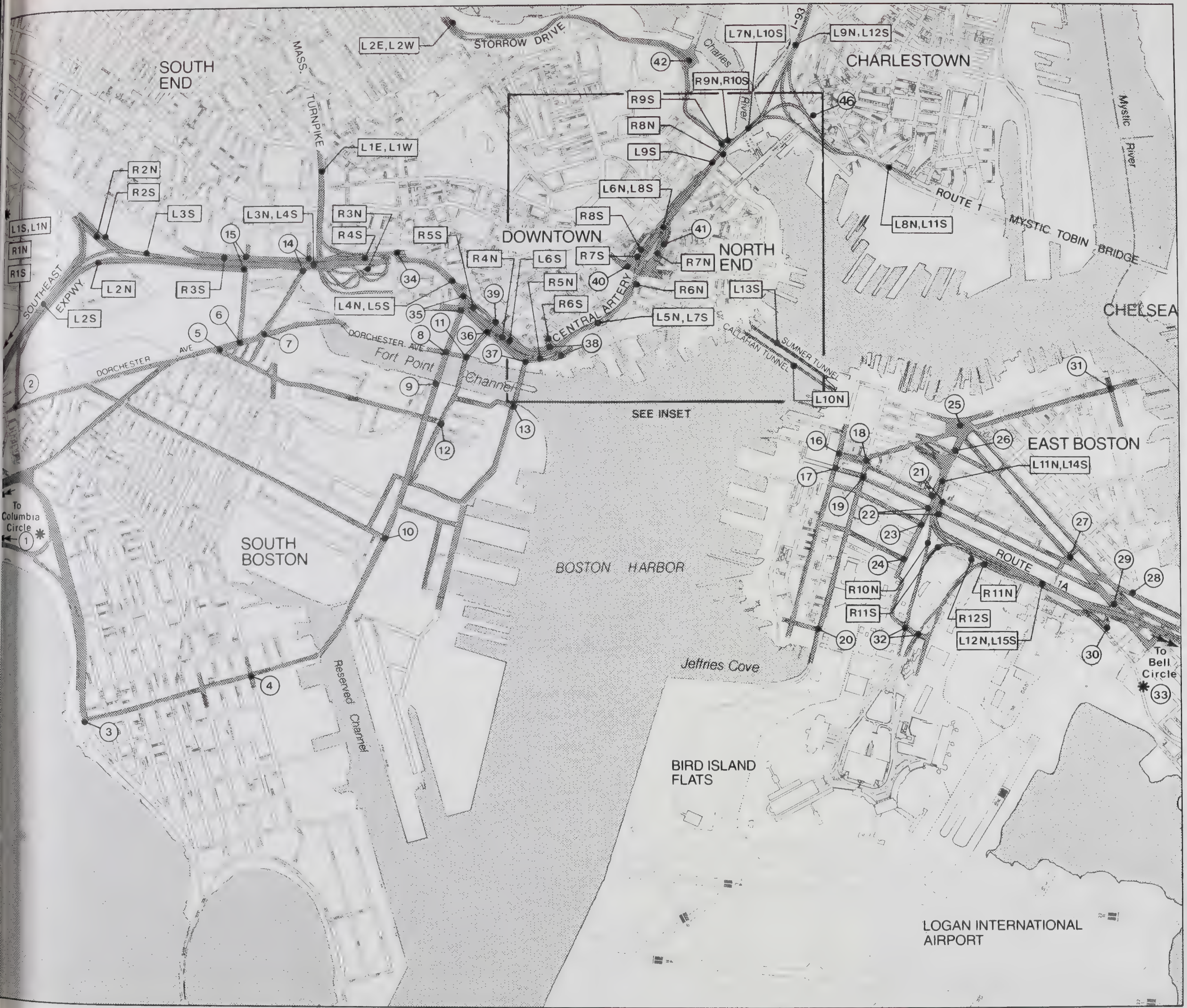
In South Boston, heavy trucks are forced to use congested local residential streets to get to the industrial area generally north of First Street, because of weight restrictions on a number of bridges linking the area to the regional highway network. The designated truck route from the regional network consists of Southampton Street; Dorchester Avenue; Broadway from the Central Artery to C Street; A Street from Dorchester Avenue to West Second Street; West Second Street from B Street to Broadway Station; and East and West First Streets. All streets north of East and West First Streets in the northern industrial area are also accessible to truck traffic and are therefore part of the truck route.

Existing Traffic Volumes

Table 1 presents a summary of existing (1982) and future (1990 and 2010) Average Weekday Daily Traffic (AWDT) volumes and truck percentages for key major highways and city streets.

It is evident from Table 1 that the Central Artery and Southeast Expressway carry the heaviest traffic volumes in the study area, with AWDT's ranging between 142,100 and 166,200 vehicles per day (vpd) between the I-93/Mystic-Tobin Bridge merge on the Central Artery and the Columbia Road interchange on the Southeast Expressway. The Callahan/Sumner Tunnels carry a 1982 volume of 82,800 vpd, and the Massachusetts Turnpike has an AWDT volume of 71,200 vpd just west of the Central Artery interchange. While these conditions do not reflect the new inbound-only, one-way toll system between the Mystic-Tobin Bridge and the Callahan/Sumner Tunnels, the resulting traffic diversions brought about by the new system have been relatively minor. Therefore, the 1982 conditions represent the base line from which all alternatives were compared.

On the streets analyzed in the downtown area, AWDT volumes range from 44,000 vpd on the Charlestown Bridge (North Washington Street) to 4,100 vpd on Hanover Street in the North End of Boston. AWDT truck percentages for selected roadways in the study area have been presented in Table 1, based on vehicle classification counts



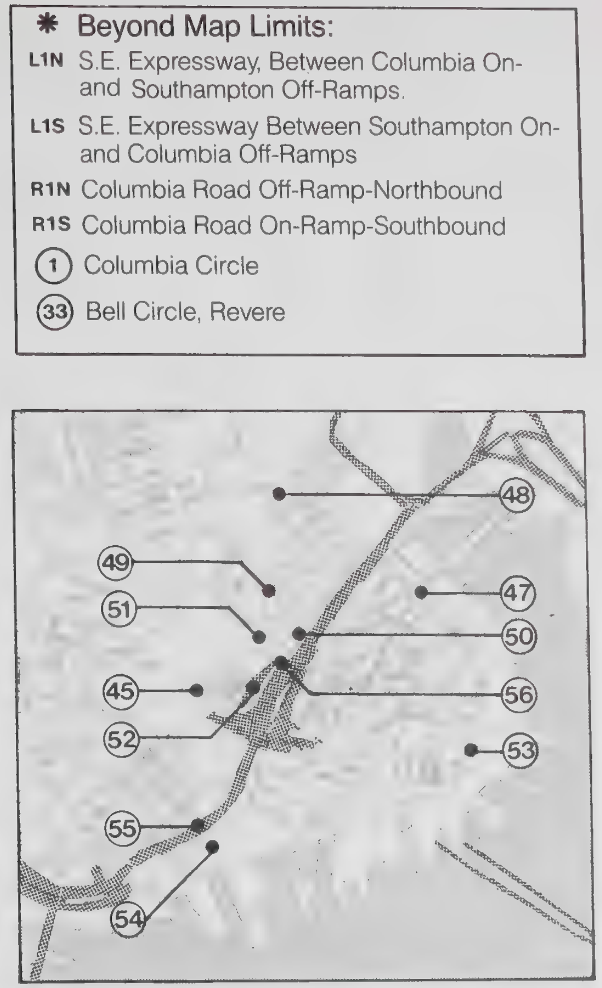


Figure 7
Affected Roadway Network – Roadway Link, Ramp, and Intersection Identification Map

0 450 900 1800 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

Legend

- (1) Existing Intersection
- L1N Existing Roadway Link or Ramp
- Affected Roadway Network

Table 1
AVERAGE WEEKDAY DAILY TRAFFIC (AWDT)
1982, 1990, 2010

	Existing 1982		No-Build Alternative 1990			2010		
Roadway Link	AWDT	% Trucks	AWDT	% Change vs. 1982	% Trucks	AWDT	% Change vs. 1982	% Truc
Sumner/Callahan Tunnels	82,800	3	83,600	+ 1.0	3	91,800	+11.0	
Mystic-Tobin Bridge - north of I-93 Ramps	72,500	6	73,900	+ 2.0	8	79,100	+ 9.0	
I-93 - north of Mystic-Tobin Bridge Ramps	89,450	7	102,200	+14.0	8	106,000	+18.5	
Central Artery - between I-93 & Storrow Drive Ramps	142,100	7	148,300	+ 4.5	8	153,800	+ 8.0	
between Causeway St. & Sumner/Callahan Ramps	161,700	8	167,500	+ 3.5	8	173,100	+ 7.0	
between Callahan/Sumner & High St. Ramps	164,500	8	169,800	+ 3.0	8	173,400	+ 5.5	
between Atlantic Ave. & Beach St. Ramps	166,200	7	169,500	+ 2.0	8	173,100	+ 4.0	
between Albany St. & Mass Ave. Ramps	153,700	7	167,200	+ 9.0	8	169,400	+10.0	
Southeast Expressway - between Columbia Rd. & South Hampton St. Ramps	162,300	7	168,000	+ 3.5	8	170,900	+ 5.3	
south of Columbia Rd. Ramps	151,620	7	156,900	+ 3.5	8	159,650	+ 5.3	
Massachusetts Turnpike - west of Central Artery	71,200	9	79,600	+12.0	8	80,000	+12.5	
Storrow Drive - west of Copley Ramps	84,000	0	86,100	+ 2.5	0	90,600	+ 8.0	
Route 1A - north of Neptune Road	30,825	3	35,800	+16.0	3	40,000	+30.0	
Logan Airport Access/Egress Roads (Main)	55,450	2	66,300	+20.0	2	82,100	+48.0	
Porter St. - between Cottage & Wellington Sts.	8,425	5	10,000	+18.7	5	11,700	+38.9	
Maverick St. - between Cottage & Orleans Sts.	4,200*	5	4,300*	+ 2.4	5	4,700*	+12.0	
Sumner St. - between Orleans & Cottage Sts.	2,400*	5	2,500*	+ 4.2	5	2,700*	+12.5	
Meridian Street - northwest of Condor Street	15,100	5	17,700	+17.2	5	18,300	+21.2	
Bennington Street - west of Route 1A	19,125	5	20,000	+ 4.6	5	21,100	+10.0	
Columbia Road - north of Columbia Circle	21,750	2	25,875	+19.0	2	27,350	+25.7	
L Street - north of Day Boulevard	12,325	1	13,825	+12.0	1	14,150	+14.8	
East First Street - west of Summer Street	2,900	21	4,550	+57.0	21	4,800	+65.5	2
D Street - southwest of Summer Street	6,500	8	9,925	+53.7	13	10,900	+67.7	1
Summer Street - east of Fort Point Channel	27,000	10	35,475	+74.8	8	36,450	+79.6	
Congress Street - east of Fort Point Channel	11,000	9	14,550	-15.9	15	15,550	-10.0	1
Northern Avenue - east of Fort Point Channel	18,050	8	30,250	+67.6	8	32,250	+79.2	
Dorchester Avenue - south of A Street	23,450	6	25,450	+ 8.5	5	25,650	+ 9.4	
Frontage Road - approach to W. Fourth St. Bridge	26,950*	11	27,200*	+ 1.0	11	27,600*	+ 2.5	1
West Fourth Street Bridge	11,000	12	10,650	- 3.2	13	10,650	- 3.2	1
Broadway Bridge	20,600	13	26,150	+26.9	10	26,150	+26.9	1
Atlantic Avenue - between Summer & Congress Sts.	16,900*	-	20,300*	+20.1	10	20,700*	+22.5	1
Seaport Access Road - southwest of Summer St.	N/A	-	8,300	-	11	9,300	-	1
State St. - between Atlantic Ave. & Surface Artery	5,100*	4	10,400*	+103.9	4	12,500*	+145.1	
North St. - between Congress & Blackstone Sts.	16,500	4	19,800	+20.0	4	25,800	+56.4	
North Washington St. - between Keany Sq. & Cross St.	21,550	4	34,400	+59.6	4	35,100	+62.9	
Cross St. - between Hanover & No. Washington Sts.	25,200*	3	27,800*	+10.3	3	31,000*	+23.0	
Cross St. - between Salem & New Chardon Sts.	4,750*	3	8,300*	+74.7	3	11,500*	+142.1	
New Chardon - between North Washington & Merrimac Sts.	17,300*	4	20,300*	+17.3	4	25,000*	+44.5	
Merrimac St. - between New Chardon & Sudbury Sts.	16,550	5	18,000	+8.8	5	19,900	+20.2	
New Sudbury St. - between Congress & Blackstone Sts.	12,450*	3	13,500*	+8.4	3	20,200*	+62.2	
Commercial St. - northeast of Keany Sq.	18,650	6	20,500	+9.9	6	24,800	+33.0	
Causeway St. - southwest of Keany Sq.	22,150	7	24,500	+10.6	7	25,600	+15.6	
Hanover St. - northeast of Cross St.	4,150	4	5,000	+20.5	4	5,300	+27.7	
Congress St. - between Sudbury & North Sts.	18,500	4	27,000	+45.9	4	29,200	+57.8	
North Washington St. - south of Keany Sq.	21,550	9	34,400	+59.6	9	35,100	+62.9	

* One-Way Volume

N/A - Not applicable for this alternative.

erformed as part of this study.

raffic Levels of Service: Definition

Six discrete levels of service LOS) describe traffic operating onditions along roadways and at ignalized and unsignalized ntersections. The six levels, epresented by the letters A through , range from free-flow to jammed onditions. To estimate levels of ervice, two parameters are ecessary:

1) Volume-to-capacity (v/c) ratio (for roadway links and intersections), and

2) Operating speed (for roadway links only).

For intersections, level of service is a function only of the elationship between intersection pproach volumes and capacities, which n turn relate to tolerable delays at a given intersection. For both links and intersections, a v/c ratio equal o 1.0 corresponds to the upper limit of LOS E. A v/c ratio greater than 1.0 indicates LOS F conditions. Average attainable operating speed on a link can decrease not only due to increased traffic congestion (hence the relationship between v/c and operating speed), but also due to decreased vehicle maneuverability which may be independent of traffic volume. Factors such as poor roadway geometry (horizontal and vertical alignments); significant pedestrian movements; curbside parking; double parking; pavement surface condition; and the closeness of roadside obstructions to the travel way (barriers, trees, etc.) cause motorists to drive more slowly. The net result is the same: a degradation of level of service. Figure 8 illustrates the six levels of service.

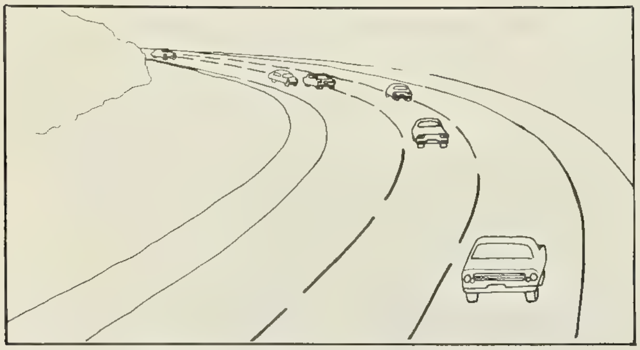
A theoretical v/c ratio greater than 1.0 is a measure of relative congestion and is indicative of a link or intersection which has vehicle demands (arrivals) that exceed the rate at which it can service them (departures) during the given hourly period, much like a toll booth operation. In actuality, traffic cannot flow through the link or intersection at a rate greater than its physical and operational capacity (i.e., v/c = 1.0). The result, when volume exceeds capacity, is congestion, queuing and actual volumes that are often less than theoretical capacity due to stop-and-go conditions. A common example of this situation is when a roadway link's capacity is greater than a downstream intersection's capacity. Traffic may be relatively free flowing on the link and may be significantly less than the link's capacity. This volume, however, may exceed the downstream intersection's ability to service it (capacity), such that the intersection experiences congestion and queuing during that period. For example, a v/c ratio of 1.2 for an intersection for a one-hour period indicates that on the average 1.2 vehicles arrived but only 1.0 vehicles were serviced, resulting in increased (lengthened) queues during this period. Vehicle arrivals in excess of departures will cause queuing and tend to prolong (or spread) the peak period. The queues will dissipate only after arrival rates of succeeding periods have decreased to below 1.0 for a length of time sufficient to service these arrivals <u>and</u> the queues remaining from previous periods. Because of excessive delays, motorists may change their hour of travel, if possible, or change their travel mode.

Existing V/C Ratios and Levels of Service

Table 2 presents peak hour traffic volumes, v/c ratios, average operating speeds, and levels of service for the affected roadway network. This section summarizes existing v/c ratios and levels of service for the affected highway links, and for streets and intersections.

Highway Facilities

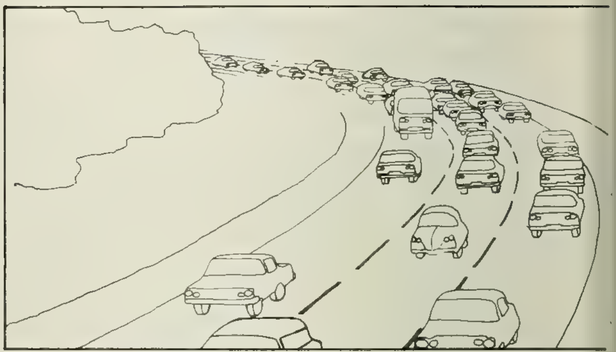
<u>AM Peak</u>. Traffic on the



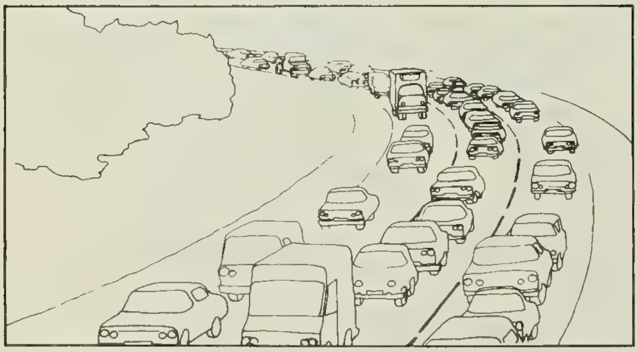
Level of Service A: Traffic is free flowing without physical restrictions on speed or maneuverability.

Level of Service B: Traffic moves in a stable flow wit slight delays. The driver is reasonably free to choose lane and speed.

Level of Service C: Traffic volume controls speed and choice of lane, to a degree, but satisfactory movement is still maintained. Moderate delays are experienced.



Level of Service D: Traffic volume affects the mainte nance of speed and choice of lane, causing congeste unstable flow.



Level of Service E: Traffic moves in an unstable flow with low speeds, increased congestion, and delays. Traffic volumes are at or near capacity.

Level of Service F: Forced flow conditions (stop anc go). Traffic moves at very low speeds, if at all, resultir in significant congestion.

Figure 8
Pictorial Representation of Level of Service

Source: The Transportation Research Board, Washington, D.C

northbound Expressway/Artery currently operates at LOS E or F from the Columbia Road on-ramp to the High-Level Bridge during the AM peak hour. Northbound, Central Artery operating speeds during this period are typically less than 35 miles per hour (mph). Southbound, the Central Artery also operates at LOS E or F from the Interstate Route 93 and Mystic-Tobin Bridge junction to the Kneeland Street on-ramp. Southbound operating speeds range from 20 to 35 mph on this section of the Artery. These conditions occur because of the numerous entrance and exit ramps, inadequate acceleration and deceleration lanes, the bottleneck at the High-Level Bridge, and heavy demand volumes.

Inbound Route 1A in East Boston is free flowing until the queue from the Sumner Tunnel is reached. Outbound flow in the Callahan Tunnel for the morning peak hour is normally within the LOS D range. Operating speeds in the Sumner Tunnel are typically less than 20 mph; corresponding speeds in the Callahan Tunnel range from 30 to 40 mph.

PM Peak. Levels of service on the northbound Expressway/Artery are typically LOS F from Massachusetts Avenue to the High-Level Bridge. Extreme congestion at several ramps to and from the Artery create operating speeds of less than 15 mph along the northbound downtown section of the Central Artery. The main restriction is the High-Level Bridge. Southbound Artery/Expressway conditions are also LOS E or F in the PM peak hour. Operating speeds southbound average from 20 to 30 mph on a typical weekday. The practical capacity of many ramps is equalled or approached in both the northbound and southbound directions of the Central Artery.

The Sumner and Callahan Tunnels also experience LOS F conditions in the PM peak hour. Back-ups originating at the Boston end of the Sumner Tunnel create inbound queues which extend back to the Airport Road/Route 1A interchange. Long queues at the Callahan Tunnel entrance are common, though recent City of Boston improvements on the approach to the Callahan Tunnel, and the elimination of the outbound Callahan Tunnel toll have had a beneficial impact on operating conditions. Some queues on the Central Artery off-ramp to the Callahan Tunnel nearly reach the Artery mainline. The Surface Artery and North Street also experience long queues approaching the Callahan Tunnel. These queues are caused primarily by the disorderly transition of eight lanes of traffic entering the two-lane tunnel.

Intersections and Local Streets

South Boston Intersections. Only five of the 15 South Boston intersections analyzed experience levels of service E or F in the AM peak hour. These are: Andrew Square; Congress Street/Dorchester Avenue; Congress Street/A Street; Northern Avenue/Sleeper Street; and Berkeley Street/West Fourth Street/Frontage Road/Albany Street. During the PM peak hour, the following intersections operate at LOS F: Columbia Road/Day Boulevard/L Street; Dorchester Avenue/West Broadway; the Congress Street intersections with Dorchester Avenue and A Street; and Northern Avenue/Sleeper Street.

East Boston Intersections. As shown in Table 2 only one intersection operates at worse than LOS D in the AM peak hour--the Porter Street/London Street intersection (LOS F). Only the McClellan Highway (Route 1A) off-ramp/Neptune Road intersection operates at LOS F in the PM peak hour, while one intersection pair--the intersections of the Airport access and egress roads with the Airport Cross Road, operate at LOS E.

Bell Circle, Revere. Bell Circle operates at LOS F in the AM peak hour and LOS D in the PM peak hour. Although reconstructed to improve operations and safety, heavy traffic volumes continue to adversely affect traffic flow.

Table 2

PEAK HOUR TRAFFIC VOLUMES, VOLUME-TO-CAPACITY (V/C) RATIOS, OPERATING SPEEDS (SP), & LEVELS OF SERVICE (LOS) 1982, 1990, 2010

(0%)= Percent Trucks

	EXISTING 1982		FUTURE NO BUILD ALTERNATIVE 1 1990		2010	
	AM	PM	AM	PM	AM	PM
MAJOR HIGHWAY LINKS - NORTHBOUND						
L1N. S.E. Expressway: Btwn. Columbia On - and Southampton Off-Ramps	7450 (8%)	4350 (8%)	8780 (8%)	6030 (8%)	9650 (8%)	6590 (8%)
L2N. Frontage Road: Adjacent to Mass. Ave. Interchange	2580 (7)	1700 (7)	2770 (8)	1630 (8)	2810 (8)	1550 (8)
L3N. S.E. Expressway: Btwn. E. Berkeley On - and Mass. Tpk. Off-Ramps	5780 (7)	3920 (8)	7940 (8)	5850 (8)	9420 (8)	6360 (8)
L4N. Central Artery: Btwn. outh St. On - and Northern Ave. Off-Ramps	6450 (8)	4200 (8)	7410 (8)	5620 (8)	9500 (8)	5550 (8)
L5N. Central Artery: Btwn. Atlantic On - and Callahan Off-Ramps	5030 (8)	4080 (8)	5740 (8)	5740 (8)	6420 (8)	6030 (8)
L6N. Central Artery: Btwn. Sumner On - and Causeway Off-Ramps	5540 (8)	4700 (8)	6000 (8)	5810 (8)	7220 (8)	6070 (8)
L7N. Central Artery: Btwn. Storrow On - and Tobin Off-Ramps	3660 (9)	5350 (8)	3570 (8)	5740 (8)	4790 (8)	5850 (8)
L8N. Mystic Tobin Bridge: North of I-93 Ramps	1580 (9)	3120 (9)	1900 (8)	3400 (8)	2010 (8)	3590 (8)
L9N. I-93: North of Tobin Bridge Ramps	2000 (8)	4290 (8)	2240 (8)	4290 (8)	2740 (8)	4400 (8)
L10N. Callahan Tunnel	2300 (3)	2850 (2)	2660 (3)	3740 (2)	3150 (3)	4070 (2)
L11N. Route 1A: Btwn. Toll Plaza and Airport Off-Ramp	2050 (3)	2580 (2)	2470 (3)	3330 (2)	2890 (3)	3590 (2)
L12N. Route 1A: Btwn. Airport On - and Neptune Off-Ramps	930 (3)	2230 (2)	1220 (3)	2440 (4)	1330 (3)	2700 (5)
MAJOR HIGHWAY LINKS - SOUTHBOUND						
L1S. S.E. Expressway: Btwn. Southampton On - and Columbia Off-Ramps	3370 (8)	5350 (8)	5130 (8)	8290 (8)	5650 (8)	8770 (8)
L2S. S.E. Expressway: Btwn. Mass. Ave. On - and Southampton Off-Ramps	3920 (8)	6150 (8)	5700 (8)	9360 (8)	6130 (8)	10430 (8)
L3S. S.E. Expressway: Btwn. Albany On - and Mass. Ave. Off-Ramps	4540 (8)	5750 (7)	5170 (8)	8360 (8)	5400 (8)	8700 (8)
L4S. Central Artery: Btwn. Kneeland On - and Albany Off-Ramps	4350 (8)	4570 (8)	5620 (8)	8070 (8)	6160 (8)	8330 (8)
L5S. Central Artery: Btwn. Congress On - and Beach Off-Ramps	4730 (8)	4500 (8)	5430 (8)	6550 (8)	5700 (8)	6880 (8)
L6S. Central Artery: Btwn. Purchase On - and Dewey Sq. Off-Ramps	5050 (8)	3880 (7)	5590 (8)	5960 (8)	5850 (8)	6140 (8)
L7S. Central Artery: Btwn. Haymarket On - and High Off-Ramps	5850 (8)	3530 (5)	5740 (8)	5220 (8)	6140 (8)	5400 (8)
L8S. Central Artery: Btwn. Causeway On - and Callahan Off-Ramps	5570 (8)	3350 (8)	5470 (8)	4850 (8)	6030 (8)	5180 (8)
L9S. Central Artery: Btwn. Storrow On - and Haymarket Off-Ramps	5220 (7)	2740 (9)	5170 (8)	4140 (8)	6130 (8)	4180 (8)
L10S. Central Artery: Btwn. Tobin On - and Storrow Off-Ramps	5430 (8)	3710 (9)	4790 (8)	4030 (8)	6140 (8)	4000 (8)
L11S. Mystic Tobin Bridge: North of I-93 Ramps	3060 (9)	2180 (9)	3340 (8)	2220 (8)	3720 (8)	2480 (8)
L12S. I-93: North of Tobin Bridge Ramps	3980 (8)	2150 (8)	3460 (8)	2850 (8)	4030 (8)	3000 (8)
L13S. Sumner Tunnel	3160 (4)	2640 (3)	3460 (3)	2810 (2)	3690 (3)	3260 (2)
L14S. Route 1A: Btwn. Airport On-Ramp and Toll Plaza	1510 (3)	1930 (2)	1630 (3)	1780 (2)	1760 (3)	2070 (2)
L15S. Route 1A: Btwn. Neptune On - and Airport Off-Ramps	1750 (4)	1620 (2)	1440 (3)	1040 (4)	1410 (3)	1150 (5)
MAJOR HIGHWAY LINKS - EASTBOUND AND WESTBOUND						
L1E. Mass. Turnpike, Eastbound: West of Expressway Ramps	4400 (9)	2080 (9)	4830 (8)	2520 (8)	4860 (8)	2920 (8)
L1W. Mass. Turnpike, Westbound: West of Expressway Ramps	1450 (9)	3180 (9)	2550 (8)	3400 (8)	2730 (8)	3660 (8)
L2E. Storrow Drive, Eastbound: West of Copley Sq. Ramps	3450 (0)	2600 (0)	3460 (0)	3000 (0)	3990 (0)	3110 (0)
L2W. Storrow Drive, Westbound: West of Copley Sq. Ramps	2430 (0)	3440 (0)	3340 (0)	3960 (0)	3880 (0)	4030 (0)
MAJOR HIGHWAY RAMPS - NORTHBOUND						
R1N. Columbia Road Off; from S.E. Expressway	500	260	570	300	630	330
R2N. Mass. Avenue On; to S.E. Expressway	460	200	1520	700	2010	700
R3N. Mass. Turnpike On; to Central Artery	1600	700	1750	700	2300	630
R4N. Atlantic Avenue Off; from Central Artery	2360	1540	3840	2110	4940	1700
R5N. Atlantic Avenue On; to Central Artery	220	800	840	1000	910	1150
R6N. Callahan Tunnel Off; from Central Artery	1330	730	1250	1410	1330	1550
R7N. Sumner Tunnel On; to Central Artery	1420	1350	1560	1520	2110	1590
R8N. Storrow Drive Off; from Central Artery	1900	1100	1820	1630	2470	1670
R9N. Storrow Drive On; to Central Artery	1200	2000	1200	2250	1400	2300
R10N. Airport Off; from Route 1A	1390	1270	1710	1850	2130	2110
R11N. Airport On; to Route 1A	270	920	460	960	570	1220
MAJOR HIGHWAY RAMPS - SOUTHBOUND						
R1S. Columbia Road On; to S.E. Expressway	400	1900	400	1980	480	2050
R2S. Mass. Avenue Off; from S.E. Expressway	720	500	720	640	800	720
R3S. Albany Street On; to S.E. Expressway	600	1900	490	2290	470	1630
R4S. Mass. Tpk./Albany St. Off; from Central Artery	1260	1300	1260	1410	1510	1670
R5S. Dewey Square Off; from Central Artery	750	480	720	520	840	370
R6S. High Street Off; from Central Artery	1300	550	1100	560	1370	520
R7S. Haymarket On; to Central Artery	1560	1890	1750	1740	2050	1670
R8S. Callahan Tunnel Off; from Central Artery	1280	1710	1520	1370	1940	1440
R9S. Storrow Drive On; to Central Artery	1500	850	2050	1150	2130	1180
R10S. Storrow Drive Off; from Central Artery	1720	1820	1630	1870	2130	1920
R11S. Airport Off; from Route 1A	770	530	870	670	1030	850
R12S. Airport On; to Route 1A	530	850	1060	1400	1330	1780

	EXISTING 1982						FUTURE NO BUILD ALTERNATIVE 1 1990						2010					
	AM			PM			AM			PM			AM			PM		
	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS
MAJOR HIGHWAY LINKS - NORTHBOUND																		
L1N.	1.03	30	F	0.60	40	C	1.22	25	F	0.83	35	E	1.34	20	F	0.91	35	E
L2N.	0.69	30	D	0.46	40	B	0.74	25	D	0.44	40	B	0.76	25	D	0.42	40	B
L3N.	1.10	30	F	0.75	30	F	1.10	30	F	0.81	30	F	1.31	20	F	0.88	25	F
L4N.	1.13	20	F	0.75	15	F	1.29	15	F	1.01	15	F	1.62	10	F	1.00	15	F
L5N.	0.96	30	F	0.78	15	F	1.06	25	F	1.06	15	F	1.19	20	F	1.11	15	F
L6N.	0.90	35	E	0.79	15	F	1.06	25	F	0.99	15	F	1.24	20	F	1.00	15	F
L7N.	0.89	25	F	1.30	15	F	0.68	40	C	1.46	15	F	0.91	30	E	1.50	15	F
L8N.	0.40	50	A	0.78	45	C	0.48	45	A	0.85	40	D	0.50	45	A	0.90	35	E
L9N.	0.28	50	A	0.59	50	C	0.31	50	A	0.59	50	C	0.38	50	A	0.61	50	C
L10N.	0.85	35	D	1.06	20	F	0.99	30	E	1.39	20	F	1.17	20	F	1.51	15	F
L11N.	0.36	35	C	0.45	30	C	0.44	30	C	0.58	20	C	0.51	25	C	0.63	20	C
L12N.	0.17	45	A	0.39	45	A	0.22	45	A	0.43	40	B	0.24	45	A	0.47	40	B
MAJOR HIGHWAY LINKS - SOUTHBOUND																		
L1S.	0.62	50	B	0.74	30	F	0.71	40	D	1.15	30	F	0.78	40	D	1.22	30	F
L2S.	0.62	50	A	0.85	30	E	0.64	40	D	1.21	25	F	0.70	30	F	1.35	20	F
L3S.	0.73	35	D	0.95	20	F	0.60	45	B	1.13	20	F	0.63	40	C	1.17	20	F
L4S.	0.74	40	C	0.78	20	F	0.78	25	F	1.13	20	F	0.85	25	F	1.16	20	F
L5S.	0.78	35	E	0.75	20	F	0.90	25	F	1.10	15	F	0.91	20	F	1.12	15	F
L6S.	0.83	30	E	0.65	25	F	0.92	25	F	1.02	20	F	0.97	20	F	1.05	20	F
L7S.	1.08	30	F	0.64	25	F	1.05	25	F	0.94	25	F	1.14	20	F	0.98	25	F
L8S.	0.96	30	F	0.62	25	F	0.95	25	F	0.91	25	F	1.03	20	F	0.94	25	F
L9S.	0.96	30	E	0.51	25	F	0.96	25	E	0.77	25	F	1.14	20	F	0.77	25	F
L10S.	1.20	20	F	0.81	25	F	0.88	25	F	0.74	25	F	1.14	20	F	0.75	30	F
L11S.	1.13	10	F	0.81	30	F	0.84	40	D	0.56	45	C	0.93	35	E	0.46	45	C
L12S.	0.73	15	F	0.40	50	C	0.64	35	E	0.53	50	C	0.74	30	F	0.55	50	C
L13S.	1.17	20	F	0.98	20	F	1.28	20	F	1.04	20	F	1.37	20	F	1.21	20	F
L14S.	0.27	5	F	0.34	5	F	0.30	5	F	0.31	5	F	0.31	5	F	0.36	5	F
L15S.	0.31	45	A	0.28	45	A	0.26	45	A	0.18	45	A	0.26	45	A	0.20	45	A
MAJOR HIGHWAY LINKS - EASTBOUND AND WESTBOUND																		
L1E.	0.80	40	D	0.37	45	C	0.87	30	E	0.45	45	C	0.88	30	E	0.52	45	C
L1W.	0.27	55	A	0.58	55	B	0.46	55	B	0.62	55	B	0.49	55	B	0.66	50	C
L2E.	0.59	40	C	0.45	40	C	0.59	40	C	0.51	40	C	0.69	40	C	0.53	40	C
L2W.	0.42	40	C	0.59	40	C	0.57	40	C	0.68	40	C	0.67	40	C	0.69	40	C
MAJOR HIGHWAY RAMPS - NORTHBOUND																		
R1N.	0.34	35	C	0.17	35	C	0.38	35	C	0.20	35	C	0.46	35	C	0.22	35	C
R2N.	0.30	35	D	0.13	40	B	0.99	30	F	0.46	35	D	1.31	30	F	0.46	35	D
R3N.	1.08	20	F	0.51	30	C	1.17	20	F	0.51	30	C	1.56	10	F	0.46	30	C
R4N.	1.58	15	F	1.03	20	F	>2.00	10	F	1.40	15	F	>2.00	5	F	1.13	20	F
R5N.	0.16	25	F	0.53	15	F	0.61	25	F	0.66	15	F	0.59	20	F	0.76	15	F
R6N.	0.86	25	E	0.47	20	F	0.81	25	E	0.90	20	F	0.86	20	F	0.99	15	F
R7N.	0.91	30	E	0.87	30	E	1.00	15	F	0.98	15	F	1.37	10	F	0.98	15	F
R8N.	0.62	35	C	0.37	40	C	0.59	35	C	0.55	40	C	0.80	25	E	0.56	40	C
R9N.	0.78	30	E	1.37	10	F	0.78	30	E	1.54	10	F	0.91	30	E	1.58	10	F
R10N.	0.87	30	E	0.79	30	E	1.07	25	F	1.14	25	F	1.33	20	F	1.30	20	F
R11N.	0.17	40	B	0.57	40	B	0.28	40	B	0.59	35	C	0.36	40	B	0.76	30	D
MAJOR HIGHWAY RAMPS - SOUTHBOUND																		
R1S.	0.27	35	C	1.28	25	F	0.27	35	C	1.33	25	F	0.32	35	C	1.38	20	F
R2S.	0.23	40	B	0.16	45	A	0.23	40	B	0.20	40	B	0.27	40	B	0.23	40	B
R3S.	0.40	30	C	1.25	20	F	0.33	30	C	1.51	20	F	0.33	30	C	1.07	20	F
R4S.	0.85	25	E	0.88	25	E	0.85	25	E	0.95	20	E	1.02	15	F	1.13	15	F
R5S.	0.50	30	C	0.32	35	C	0.49	30	C	0.34	35	C	0.56	30	C	0.25	35	C
R6S.	0.87	20	E	0.36	30	C	0.74	20	E	0.36	30	C	0.89	20	E	0.34	30	C
R7S.	1.01	15	F	1.20	15	F	1.13	15	F	1.12	15	F	1.32	10	F	1.06	15	F
R8S.	0.41	15	F	0.57	15	F	0.49	15	F	0.46	15	F	0.62	15	F	0.48	15	F
R9S.	0.98	20	F	0.57	30	C	1.34	20	F	0.75	25	E	1.39	20	F	0.77	25	E
R10S.	1.12	20	F	1.22	20	F	1.06	20	F	1.25	20	F	1.39	20	F	1.29	20	F
R11S.	0.47	35	B	0.33	40	A	0.54	30	C	0.42	35	B	0.63	30	C	0.53	30	C
R12S.	0.34	30	C	0.55	25	F	0.69	30	C	0.91	20	F	0.87	25	E	1.17	15	F

ble 2 ___(cont.)
AK HOUR TRAFFIC VOLUMES,
LUME-TO-CAPACITY (V/C) RATIOS,
ERATING SPEEDS (SP), &
VELS OF SERVICE (LOS)
82, 1990, 2010

(0%) = Percent Trucks
* = Signalized Intersection

Notes: 1. V/C ratios and levels of service, at unsignalized intersections, indicate minor street operating conditions.

2. Intersection volumes are total approach volumes.

INTERSECTIONS	EXISTING 1982 AM	EXISTING 1982 PM	FUTURE NO BUILD ALTERNATIVE 1 1990 AM	1990 PM	2010 AM	2010 PM
South Boston						
1. Columbia Circle	5260 (1%)	4340 (1%)	6150	5030	6200	5710
2. Andrew Square*	2000 (14)	1650 (8)	3070	2980	3160	3210
3. Columbia Rd./Day Blvd./L St.	1390 (1)	1450 (1)	1370	1480	1370	1530
4. L St./East First St./Summer St.*	1500 (6)	1550 (5)	1890	1810	1910	1860
5. Dorchester Ave./W. 5th St./A St.*	2300 (5)	2140 (5)	2410	2200	2440	2550
6. Dorchester Ave./W. 4th St.*	2230 (6)	2060 (7)	2390	2100	2450	2310
7. Dorchester Ave./W. Broadway*	2650 (9)	2750 (7)	2690	2210	2790	2460
8. Summer St./Dorchester Ave.*	2650 (10)	2400 (6)	3120	4060	3140	4080
9. Summer St./Melcher St.*	2340 (7)	2040 (4)	2800	2960	2770	3040
10. Summer St./D St.*	2380 (9)	2220 (6)	2610	2570	2410	2600
11. Congress St./Dorchester Ave.	2020 (8)	1730 (6)	2300	3390	2320	3540
12. Congress St./A St.	950 (11)	1080 (5)	1240	2010	1240	2150
13. Northern Ave./Sleeper St.	1270 (12)	1730 (3)	2660	2370	2690	2410
14. Herald St./Broadway/Frontage Rd./Albany St.*	3670 (9)	4140 (6)	4910	4330	4960	5000
15. Berkeley St./W. Fourth St./Frontage Rd./Albany St.*	4530 (8)	4410 (6)	5910	6440	6090	5700
East Boston and Revere						
16. Sumner St./Meridian St./Chelsea St.*	620 (10)	720 (5)	690	880	690	890
17. Sumner St./Bremen St.	460 (7)	550 (4)	520	550	460	550
18. Maverick St./Meridian St./Chelsea St.	880 (8)	990 (4)	830	1030	830	1060
19. Maverick St./Bremen St.	480 (5)	510 (3)	480	540	480	540
20. Maverick St./Jeffries St./Airport Access Rd.	380 (6)	320 (8)	380	320	380	320
21. Porter St./Chelsea St./Visconti Rd.*	1560 (6)	1500 (3)	2120	1850	2430	2170
22. Porter St./Bremen St.	980 (4)	1290 (2)	1000	1320	1220	1510
23. Porter St./Orleans St.	570 (5)	790 (2)	820	880	1020	1030
24. Porter St./Cottage St.	540 (6)	670 (2)	770	810	990	970
25. Central Square (Meridian St./Saratoga St.)*	1000 (7)	1040 (4)	1170	1210	1260	1230
26. Porter St./London St.	850 (4)	670 (5)	930	840	1060	990
27. Bennington St./Prescott St.	1150 (5)	930 (4)		NO DATA AVAILABLE		
28. Chelsea St./East Eagle St.	1070 (5)	1190 (5)	910	940	1020	1130
29. Bennington St./Neptune Rd.	2370 (6)	1890 (6)		NO DATA AVAILABLE		
30. McClellan Off-Ramp/Neptune Rd.	920 (6)	1460 (4)	1000	1330	1140	1460
31. Condor St./Meridian St.*	1070 (6)	1330 (3)	1300	1330	1470	1630
32. Airport Crossover Roads*	3630 (3)	4860 (4)	5380	6390	6640	7870
33. Bell Circle (Revere)*	3860 (7)	4470 (4)	4760	5150	4870	5420
Downtown Boston and Charlestown						
34. Kneeland St./Surface Artery/S.B. On-Ramp*	2550 (9)	3240 (13)	3650	4010	3370	3990
35. Dewey Sq.*	3770 (8)	4890 (6)	6210	5970	5870	6280
36. Atlantic Ave./Congress St.*	3040 (6)	2740 (6)	5010	4160	4490	4790
37. Atlantic Ave./Northern Ave.	2440 (7)	3560 (5)	4790	3860	4740	4440
38. Atlantic Ave./Surface Artery/High St.*	3220 (7)	3420 (6)	5700	4220	6230	4070
39. Purchase St./Congress St.*	2250 (7)	2970 (7)	2400	2960	2620	3140
40. North St./Blackstone St./S.B. Off-Ramp	2710 (4)	3540 (4)	4040	4000	4580	4400
41. Cross St./Hanover St./Salem St.	2070 (4)	2110 (2)	2840	2360	2680	2610
42. Leverett Circle*	6720	6260	6860	6420	6560	6770
45. Congress St./North St.	1920 (4)	2300 (3)	2610	2630	3010	2630
46. City Square (Charlestown)	3690 (11)	3680 (5)	6570	7400	6050	7850
47. Causeway St./North Washington St./Commercial St.	4260 (3)	4610 (4)	4930	5910	4410	6620
48. Causeway St./Lomasney Way/Merrimac St./Staniford St.	1860 (3)	1880 (3)	2170	2280	2060	2410
49. New Chardon St./Merrimac St.	2910 (4)	2200 (3)	2700	2550	2570	2630
50. New Chardon St./North Washington St.	2640 (4)	2070 (3)	2590	2480	2360	2670
51. Sudbury St./Congress St./Merrimac St.	1760 (5)	3180 (2)	2480	3330	2280	3350
53. Commercial St./Hanover St.	1300 (7)	1620 (4)	1590	1550	1670	2220
54. State St./Atlantic Ave.	1560 (8)	1950 (3)	2130	2210	2260	2880
55. State St./Surface Artery	2110 (4)	2840 (6)	3060	2210	2700	3450
56. Sudbury St./Blackstone St./S.B. On-Ramp	950 (3)	1710 (2)	1870	2890	1860	2730

INTERSECTIONS	EXISTING 1982 AM V/C	SP	LOS	1982 PM V/C	SP	LOS	FUTURE NO BUILD ALTERNATIVE 1 1990 AM V/C	SP	LOS	1990 PM V/C	SP	LOS	2010 AM V/C	SP	LOS	2010 PM V/C	SP	LOS
South Boston																		
1.	0.85		D	0.52		A	0.95		E	0.65		B	0.95		E	0.76		C
2.	1.02		F	0.84		D	1.63		F	1.53		F	1.65		F	1.63		F
3.	0.25		C	1.05		F	2.00		F	1.27		F	2.00		F	1.39		F
4.	0.86		D	0.76		C	0.92		E	0.86		D	0.93		E	0.90		D
5.	0.53		A	0.65		B	0.55		A	0.69		B	0.56		A	0.81		D
6.	0.58		A	0.50		A	0.50		A	0.52		A	0.52		A	0.58		A
7.	0.87		D	1.07		F	0.92		E	0.86		D	0.96		E	0.95		E
8.	0.78		C	0.76		C	0.99		E	1.46		F	0.99		E	1.44		F
9.	0.44		A	0.48		A	0.53		A	0.69		B	0.53		A	0.67		B
10.	0.73		C	0.69		B	0.78		C	0.75		C	0.60		B	0.76		C
11.	2.00		F	2.00		F	>2.00		F	>2.00		F	2.00		F	>2.00		F
12.	0.88		E	1.25		F	1.47		F	>2.00		F	1.47		F	>2.00		F
13.	1.30		F	2.00		F	>2.00		F	>2.00		F	1.91		F	>2.00		F
14.	0.84		D	0.80		C	1.07		F	0.90		E	1.13		F	0.94		E
15.	1.03		F	0.76		C	1.07		F	0.77		C	1.11		F	0.80		C
East Boston and Revere																		
16.	0.26		A	0.34		A	0.44		A	0.46		A	0.44		A	0.46		A
17.	0.08		B	0.12		B	0.22		B	0.12		B	0.14		B	0.12		B
18.	0.52		C	0.44		B	0.52		C	0.63		D	0.51		C	0.69		D
19.	0.21		A	0.15		A	0.20		A	0.17		B	0.20		A	0.17		B
20.	0.26		A	0.15		A	0.26		A	0.14		A	0.26		A	0.14		A
21.	0.83		D	0.65		B	0.93		E	0.88		D	1.27		F	1.01		F
22.	0.52		D	0.75		E	0.94		E	0.73		E	1.09		F	1.04		F
23.	0.11		A	0.22		C	0.27		D	0.20		C	0.27		D	0.28		D
24.	0.34		A	0.32		A	0.49		A	0.52		A	0.64		B	0.62		B
25.	0.42		A	0.36		A	0.46		A	0.44		A	0.57		A	0.54		A
26.	1.05		F	0.37		C	1.22		F	0.60		D	1.30		F	0.99		E
27.	0.23		D	0.14		D				NO DATA AVAILABLE								
28.	0.18		C	0.26		C	0.22		D	0.12		A	0.28		D	0.14		A
29.	0.68		B	0.62		B				NO DATA AVAILABLE								
30.	0.55		C	1.27		F	0.38		C	1.04		F	0.65		D	0.96		F
31.	0.42		A	0.51		A	0.41		A	0.59		A	0.65		B	0.59		A
32.	0.64		B	0.95		E	0.77		C	0.81		D	0.94		E	0.99		E
33.	1.15		F	0.89		D	1.33		F	1.18		F	1.37		F	1.24		F
Downtown Boston and Charlestown																		
34.	0.69		B	0.86		D	1.04		F	0.71		C	0.97		E	0.90		E
35.	0.64		F	0.73		F	>2.00		F	1.34		F	1.94		F	1.77		F
36.	0.94		E	0.85		D	1.54		F	1.24		F	1.36		F	1.33		F
37.	2.00		F	2.00		F	>2.00		F	2.00		F	2.00		F	>2.00		F
38.	0.89		D	0.80		C	1.42		F	0.93		F	1.42		F	0.81		F
39.	0.65		B	0.82		D	0.64		B	0.72		C	0.68		B	0.77		D
40.	2.00		F	2.00		F	>2.00		F	>2.00		F	2.00		F	>2.00		F
41.	1.89		F	2.00		F	>2.00		F	>2.00		F	2.00		F	>2.00		F
42.	0.96		E	0.75		F	1.09		F	0.92		F	0.99		E	0.80		F
45.	0.54		A	0.71		C	0.68		B	0.85		D	0.89		D	0.70		E
46.	0.81		D	1.20		F	1.08		F	1.26		F	1.06		F	1.23		F
47.	0.77		C	1.00		E	1.12		F	1.37		F	1.01		F	1.43		F
48.	>2.00		F	2.00		F	0.81		D	0.91		E	0.76		C	0.85		D
49.	0.65		B	0.44		A	0.65		B	0.44		A	0.65		B	0.63		B
50.	0.82		D	0.58		F	0.88		D	0.69		F	0.82		D	0.71		F
51.	0.29		A	0.54		F	0.52		A	0.57		F	0.49		A	0.60		F
53.	0.63		E	0.53		E	0.93		E	0.20		C	0.51		D	0.40		C
54.	0.39		A	0.47		A	0.74		C	0.71		C	0.65		B	0.68		B
55.	0.51		A	0.67		B	0.99		E	0.85		D	0.71		C	0.91		E
56.	0.75		C	0.26		F	0.85		D	0.40		F	0.85		D	0.45		F

City Square, Charlestown. The intersection of Rutherford Avenue, Chelsea Street, and North Washington Street in City Square currently operates at LOS D during the AM peak hour, with heaviest congestion on the Chelsea Street/Rutherford Avenue approaches to the North Washington Street Bridge. In the PM peak hour, this intersection operates at LOS F, with major congestion on the northbound approach of the North Washington Street Bridge towards Chelsea Street and Rutherford Avenue.

Downtown Boston Intersections. Eight of the twenty intersections analyzed for downtown Boston presently operate at LOS E or F in the morning peak hour primarily due to heavy traffic: Atlantic Avenue/Congress Street; Atlantic Avenue/Northern Avenue; North Street/Blackstone Street/Southbound Artery off-ramp; Cross Street/Hanover Street/Salem Street; Causeway Street/Staniford Street/Merrimac Street/Lomasney Way; Hanover/Commercial Street; and Leverett Circle. Dewey Square (which is actually four separate intersections) also operates at LOS F in the AM peak hour due primarily to very heavy pedestrian volumes from South Station, double parking, and passenger pick up.

During the PM peak hour, the following intersections operate at LOS E or F: Atlantic Avenue/Northern Avenue; North Street/Blackstone Street/Southbound Artery; Cross Street/Hanover Street/Salem Street; Causeway Street/Staniford Street/Merrimac Street/Lomasney Way; Hanover/Commercial Street; Sudbury Street/Blackstone Street; Sudbury Street/Congress Street/Merrimac Street; New Chardon Street/North Washington Street/Cross Street/Southbound off-ramp; Keany Square (congested by outbound traffic destined for the North Washington Street Bridge, City Square, and points beyond); Leverett Circle and Dewey Square.

Existing Central Artery Bottlenecks and Congestion Points

The severe bottleneck on the northbound Central Artery is the approach to the High-Level Bridge. In the southbound direction, the High-Level Bridge itself is a bottleneck. On- and off-ramp merges, diverges and weaves also create numerous congestion points along the Central Artery. There is also an existing AM peak hour queue at the northbound Columbia Road on-ramp merge area. Individual queues which overlap are dominated by the longest queue. These queues are discussed further in the following subsection.

3.1.2 Future Roadway Characteristics Without the Project

Future Roadway Network Changes

Several major roadway construction projects planned for the future are assumed to be completed by the time portions of the Third Harbor Tunnel and/or Central Artery improvements are completed. These include:

1. The Central Artery North Area Project.
2. Southeast Expressway upgrading project, creating four lanes in each direction to the Dewey Square Tunnel.
3. Street pattern changes associated with the proposed South Station Transportation Center.
4. Relocated Northern Avenue Bridge.
5. West Fourth Street Bridge Replacement.
6. Roadway improvements and street pattern changes associated with the North Station Urban Renewal Project.

7. Atlantic Avenue Phase III Project.

8. A Seaport Connector Road, which provides a connection between B Street and Northern Avenue in South Boston.

Deck replacement of the Central Artery is considered in this study as the No-Build Alternative.

Future Traffic Volumes

AWDT Volumes

Table 1, previously presented, summarizes AWDT volumes for the affected roadway network for 1990 and 2010 No-Build conditions.

Traffic crossing Boston Harbor will increase approximately ten percent between 1982 and 2010 under the No-Build Alternative, to 170,000 vehicles on an average weekday. Traffic congestion and queuing will occur during several hours of the day on the Central Artery, the Mystic-Tobin Bridge, and in both existing tunnels. For the Callahan/Sumner Tunnels in particular, at-capacity or forced-flow conditions--and resulting delays, queues, and backups onto the Central Artery--will increase from five hours each commuting weekday in 1982 to 14 hours (generally from 6 AM to 8 PM) in 2010.

Truck percentages on the major roads are expected to be similar to 1982, with the exception of D Street in South Boston, which will experience increased truck volumes due to new development in the northern industrial Seaport area.

In East Boston, traffic in 2010 is expected to increase by approximately 39 percent on Porter Street, and on Maverick and Sumner Streets by about 12 percent.

For the downtown Boston streets analyzed, AWDT increases in 2010 under the No-Build Alternative range from a low of about 12 percent on North Washington Street to a high of about 145 percent on State Street. This increase is due to various factors, including new development and regional growth, but primarily due to motorists attempting to short-cut the severe congestion on the Central Artery. Typical increases are on the order of 30 to 60 percent over existing conditions. Truck percentages, for the most part, are expected to remain as existing for downtown Boston streets.

Peak Hour Volumes

Future 1990 and 2010 peak hour traffic volumes are summarized in Table 2. Growth of peak period traffic demand between 1990 and 2010 for the major links of the No-Build condition appears to be most pronounced during the PM peak hour. As can be seen by examining Table 2, peak hour growth from 1982 to 2010 on the Mystic-Tobin Bridge is projected to increase by approximately 0.5 percent per year, while the Callahan/Sumner Tunnels are projected to experience a 1.2 percent annual increase during this period. These additional demands will exacerbate the poor operating conditions currently experienced on the major highway network.

Future V/C Ratios and Levels of Service

Highway Facilities

Future (1990, 2010) peak hour No-Build Alternative v/c ratios and levels of service are presented in Table 2.

AM Peak. By 2010, northbound traffic conditions are expected to deteriorate further to LOS F on the Central Artery and Southeast Expressway from Columbia Circle to Causeway Street. Traffic flow on the High-Level Bridge will improve to LOS C because of the proposed Central Artery North Area Project by 1990, but will degrade to LOS E by 2010. Both the Sumner and Callahan Tunnels are expected to operate at LOS F in the AM peak.

Southbound Artery/Expressway traffic conditions during the AM peak hour will be LOS F from the Mystic-Tobin Bridge to the Albany Street on-ramp by 1990. Congested conditions and delays will be exacerbated by increasing traffic demand through 2010.

PM Peak. By 2010, northbound traffic conditions will be at LOS F from the Berkeley Street/West Fourth Street interchange to the High-Level Bridge, with LOS E operations extending back to the Columbia Road ramps. LOS F conditions will prevail in 2010 in the southbound direction, from the Mystic-Tobin Bridge to Columbia Road. Both the Sumner and Callahan Tunnels will also operate at LOS F during the PM peak period, because of increasing cross-harbor traffic demand.

As an indication of the increased congestion expected on the major study highways, an estimate of the number of congested hours of operation (LOS E or F) on an average day has been made for the No-Build Alternative in 2010, compared to existing conditions. Reference is made to Table 34 presented in Section 4.2 TRANSPORTATION for a complete listing of these estimates. On the Central Artery south of the tunnels, congestion will increase from 5 hours in 1982 to 13 hours in 2010 travelling northbound and from 5 hours to 12 hours, travelling southbound. North of the tunnels, congestion will increase from 8 hours in 1982 to 12 hours in 2010 for northbound traffic, and from 4 hours to 8 hours for southbound traffic. The congestion in both the Callahan and Sumner Tunnels will increase from 5 hours per day in 1982 to 14 hours per day in 2010. On the Southeast Expressway at Southampton Street, congestion will increase from 4 hours in 1982 to 9 hours in 2010 inbound and from 4 hours to 13 hours, respectively, in the outbound direction. Likewise, congestion on the High-Level Bridge inbound will increase from 4 hours in 1982 to 5 hours in 2010, despite improvements from the Central Artery North Area Project.

Intersections and Local Streets

South Boston Intersections. As shown in Table 2, 11 out of 15 of the key intersections in South Boston will be operating at LOS E or F in the AM peak hour by 2010, as compared to 5 intersections today. During the PM peak hour, 8 of the 15 intersections will be operating at LOS E or F under No-Build conditions in 2010, as compared to 5 intersections currently.

East Boston Intersections. By 2010, as Table 2 indicates, 4 of the 16 key intersections will be operating at LOS E or F during the AM peak hour, as compared to 2 East Boston intersections today. During the PM peak hour, 5 of these intersections will be operating at LOS E or F, as compared to 3 intersections in 1982.

Bell Circle, Revere. Bell Circle is expected to operate at LOS F in both 1990 and 2010, during the AM and PM peak hours, as compared to LOS F and D at present.

City Square, Charlestown. Reconstruction of the City Square surface roadways (part of the Central Artery North Area Project) will result in improvements in geometry and traffic flow conditions by 1990 as compared to existing conditions. As proposed, the existing rotary at City Square will be replaced by a signalized four-way intersection (Chelsea Street/Rutherford Avenue/I-93 ramps) controlling traffic movements between the local roadway system and the highway system. Although the traffic operations will be improved because of these geometric and other revisions, City Square will continue to be congested.

Downtown Boston Intersections. Of the 20 intersections analyzed in the downtown Boston area, during the AM peak hour, 2 additional intersections will operate at LOS E or F in 2010. During the PM peak hour, three additional intersections will operate at LOS E or F in 2010 as

Table 3

EXISTING AND FUTURE NO-BUILD
INDIVIDUAL PEAK HOUR QUEUE LENGTH COMPARISON*
(IN MILES)

Northbound Exp./Artery Queue Source	1982 AM	1982 PM	1990 AM	1990 PM	2010 AM	2010 PM
Columbia Road On-Ramp	0.2	0	0.5	0	0.5	0
Mass. Ave. On-Ramp	n.c.**		1.0	0	1.3	0
Frontage Rd./E. Berkeley On-Ramp	1	0	0.3	0.5	0.6	0.9
Mass. Pike On-Ramp	0.6	0	0.9	0	1.2	0.1
Northern Ave. or Atlantic Ave. On-Ramp	n.c.**		0.5	0.8	0.8	0.9
Callahan Tunnel Off-Ramp	0	0.1	0	0.5	0.1	0.7
Storrow Drive Off-Ramp	0	0	0	0	0	0
High-Level Bridge (I-93/Route 1 Merge)	0	2.0	0	1.9	0	2.0
Southbound Exp./Artery Queue Source						
High-Level Bridge (I-93/Route 1 Merge)	2.1	0	1.4	0	3.2	0
Causeway/Storrow Dr. Ramps	0	0	0	0	0	0
Callahan Tunnel/ Haymarket Off-Ramp	0	0	0.3	0.3	0.3	0.3
Haymarket On-Ramp	0.5	0.1	0.6	0.5	0.8	0.5
Purchase/Cong. On-Ramp	n.c.**		0	0.5	0	0.6
Mass. Pike On-Ramp	n.c.**		0	1.5	0	1.4
Albany St. On-Ramp	0	0.7	0	0.6	0	0.5
Mass. Ave On-Ramp	n.c.**		0	0.2	0	0.5
Columbia Road On-Ramp	0	0.6	0	0.1	0	0.1

* Queues are not additive. Where overlaps occur, the longest queue prevails.
** Not calculated.

compared to the present conditions.

Central Artery Bottlenecks and Congestion Points

Year 1990

Table 3 summarizes the 1982, 1990, and 2010 individual queues expected on the Central Artery/Southeast Expressway under the No-Build Alternative. As noted previously, queues are not additive. Where they overlap, the longest queue prevails. Generally, 1990 individual queues are expected to worsen considerably in both the AM and PM peak hours, and in both directions. As in 1982, the primary queues will result from the High-Level Bridge merge with the Mystic-Tobin Bridge.

Northbound in the AM peak hour, the longest individual queues are anticipated at the Massachusetts Avenue and Massachusetts Turnpike on-ramps to the Southeast Expressway--both will generate queues about one mile long, with slight overlap. In addition, the Columbia Road on-ramp merge is expected to extend the queue behind it for an additional half mile. Further north, the Northern Avenue on-ramp is expected to generate another half-mile queue. Southbound in the AM peak hour, the primary source of congestion and delay, the High-Level Bridge is expected to generate a queue extending back nearly 0.9 miles on I-93 and 0.6 miles on Route 1. The other two southbound sources of congestion, the Haymarket on-ramp and Callahan Tunnel off-ramp, are expected to generate smaller, though significant, queues on the Central Artery between Haymarket Square and the Storrow Drive off-ramp.

Northbound in the PM peak hour, the High-Level Bridge bottleneck is expected to generate a 1.1 mile queue on I-93 and a 0.8 mile queue on the Mystic-Tobin Bridge (Route 1). This queue will then extend further southward by about a half mile, due to a queue caused by the merge of the Berkeley Street on-ramp. Southbound in the PM peak, a series of individual merge and weaving movements will combine to create a queue extending from the Massachusetts Avenue on-ramp to the Haymarket Square area, a distance exceeding two miles in length.

Year 2010

Queues anticipated on the Central Artery/Southeast Expressway in 2010 are slightly worsened or stay about the same in the northbound direction for both the AM and PM peak hours as compared to 1990 conditions. Southbound, however, the queue from the primary congestion point, the High-Level Bridge, is expected to be significantly increased, with backups of 1.9 miles towards I-93 and 1.3 miles towards the Mystic-Tobin Bridge.

3.1.3 Safety

Average yearly accidents and accident rates for the intersections on the affected roadway network were tabulated for a three year period from 1978 to 1980, and are presented in Table 4. Of the intersections analyzed for safety in the downtown area, the Keany Square intersection has the worst accident record with an average of 26 accidents annually. This is followed closely by the New Sudbury/Congress Street intersection. As indicated, year 2010 accidents along the Central Artery are expected to increase by nearly 21 percent without the project, as compared to existing conditions, while accidents at the key intersections in East Boston, South Boston, and downtown Boston are expected to increase by approximately 12, 24, and 32 percent, respectively. Because the average speeds of vehicles on these roadways are relatively low, the percentage of these accidents involving fatalities is much less than one percent.

3.1.4 Other Transportation Facilities

In addition to the roadway network, an extensive system of other transportation facilities also serve the project area. Offered by both public and private carriers, these services include bus and taxi

Table 4

YEARLY ACCIDENT SUMMARY

	Average* 1978-1980	Future 1990	No-Build 2010
Highway			
Central Artery			
Section 1:			
Rte. I-93/Rte.1 to Causeway St./ Haymarket Ramps	381	454	470
Section 2:			
Callahan/Sumner Tunnel ramps	235	260	284
Section 3:			
Northern Avenue to Dewey Square ramps	197	201	232
Section 4:			
Kneeland Street to Southampton Street ramps	200	203	206
	1013	1118	1192
Callahan/Sumner Tunnel Approaches (East Boston)	159	164	226
Total Highway Accidents	1172	1282	1418
Intersections			
South Boston			
Columbia Road/Old Colony Avenue/Day Boulevard	11	14	15
Andrew Square	8	11	12
Columbia Road/Day Boulevard/L Street	5	5	5
L Street/Summer Street/ E. First Street	7	9	9
Dorchester Avenue/ West Broadway	9	9	10
Summer Street/D Street	10	10	10
Dorchester Ave./W. Fifth St./A Street	10	9	10
Dorchester Ave./W. Fourth Street	10	10	10
Congress St./A Street	4	6	7
Northern Ave./Sleeper Street	8	13	14
East Boston			
Condor Street/Meridian Street	13	13	14
Bennington Street/Bremen Street	7	7	8
Bennington Street/Chelsea Street	23	24	25
Meridian Street/Bennington Street	13	14	15
Porter Street/Cottage Street	2	3	3
Downtown Boston			
Causeway Street/N. Washington Street	26	31	34
Congress Street/North Street	11	14	15
New Chardon Street/Merrimac Street	10	10	10
New Chardon Street/N. Washington Street	5	6	6
New Sudbury Street/Congress Street	22	31	33
Total Intersection Accidents	214	249	265
Total Accidents	1386	1531	1683

*Source: Commonwealth of Massachusetts Registry of Motor Vehicles.

services, rapid transit and heavy rail services, ferry service, and air travel services.

The primary public transportation service across Boston Harbor is provided by the Massachusetts Bay Transportation Authority's (MBTA) Blue Line rapid transit line. Figure 9 shows the location of the Blue Line, as well as other MBTA rapid transit and bus routes within the project area.

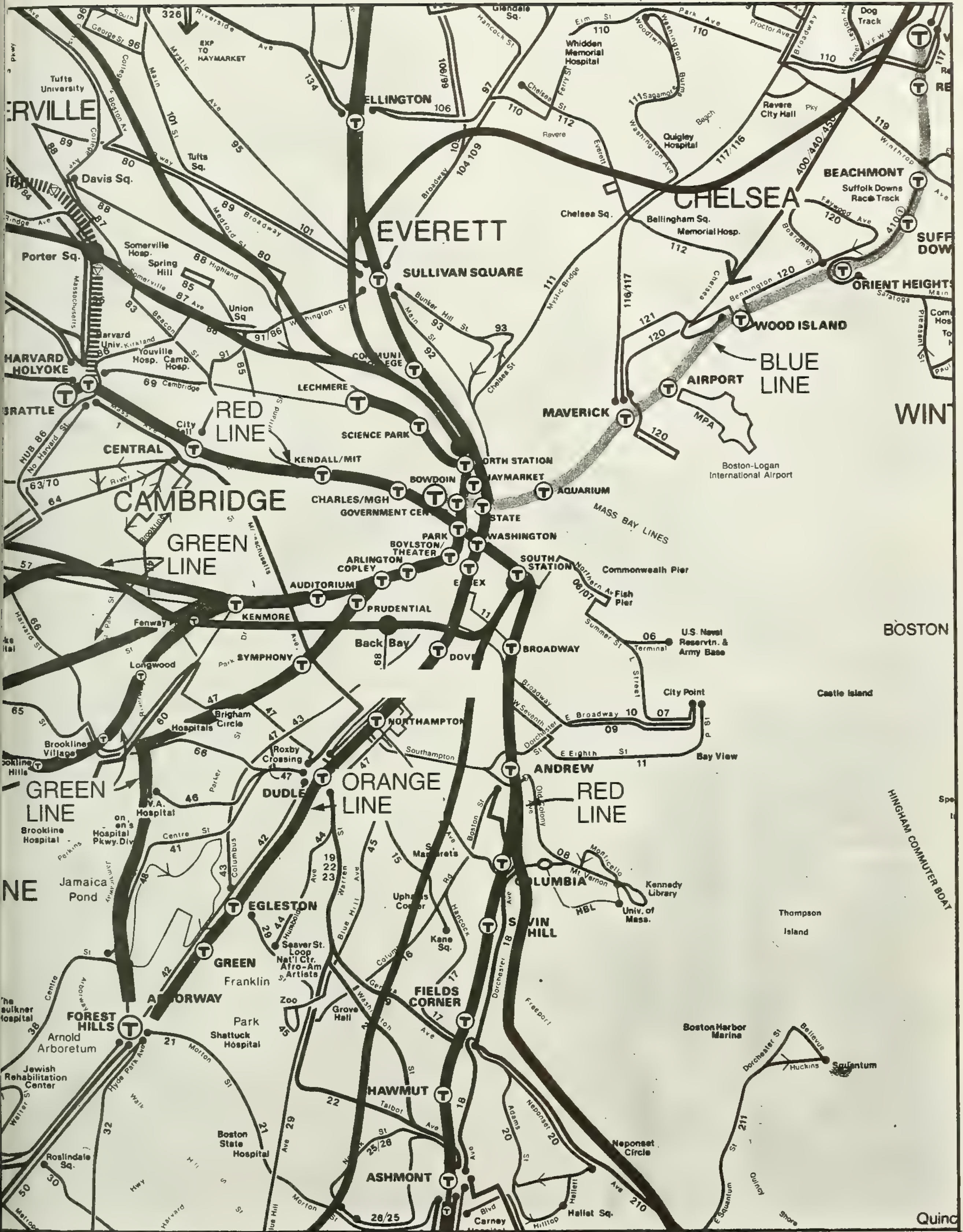
The Blue Line begins in downtown Boston and proceeds northeasterly in a subway tunnel, passing under Boston Harbor and into East Boston, emerging from the subway just north of Porter Street at Airport Station. The Blue Line continues primarily at-grade on an exclusive right-of-way through East Boston and into Revere. Stations on the Blue Line in East Boston include Maverick, Airport, Wood Island, Orient Heights and Suffolk Downs. The Blue Line operates from approximately 5:30 AM to 1:00 AM, with trains scheduled at 4-5 minute headways during morning and evening peaks, 7-8 minute headways at other times during the day, and up to 12 minute headways at nights and on weekends.

The only other direct cross-harbor transit services provided by the MBTA, and which use the Callahan and Sumner Tunnels, are five express bus routes (Routes 400, 440, 441, 442, and 450), from Lynn to Haymarket Square. None of these routes serves East Boston or Revere.

The MBTA's Red Line rapid transit line also directly serves the project area through South Boston and the Central Business District. Beginning in Cambridge, the Red Line crosses the Charles River into downtown Boston, with stops at Park Street, Washington Street, and South Station. Beyond South Station, the Red Line curves southerly under Fort Point Channel, with Broadway Station (at the intersection of Broadway and Dorchester Avenue) being the first stop in South Boston. Beyond Broadway Station, the subway continues to a station at Andrew Square, where it surfaces and splits into two branches, the older branch to Ashmont (Mattapan) and the newer branch to Braintree. Red Line headways are somewhat longer than those of the Blue Line on the two outer portions, but are more frequent north of Andrew Station. Service generally operates from 5:30 AM to 1:00 AM on weekdays with headways (north of Andrew Square) of approximately 5 minutes during peak periods and up to 8 minutes at nights and on weekends.

The northern terminus of the Orange Line is Oak Grove Station in Malden. The line passes southerly through Medford and Charlestown. South of Charlestown, the Orange Line enters a subway and passes under the Charles River and enters downtown Boston, with stops at North Station, Haymarket, State, Washington, and Essex Stations. Beyond the downtown area, the Orange Line has several stops in the Roxbury section of Boston, with a southern terminus at Forest Hills Station in Jamaica Plain. Service generally operates from 5:15 AM to 1:00 AM on weekdays with headways ranging from 12 to 15 minutes at night, 10 minutes or less during the day, and approximately 4 minutes during rush hours. Less frequent service is provided on weekends and holidays.

The MBTA's Green Line is a light rail rapid transit system with a northern terminus at Lechmere Station in East Cambridge. Southerly from Lechmere, the line crosses the Charles River on a viaduct with stops at Science Park (Leverett Circle) and North Station before descending into a tunnel before Haymarket Station. Between Haymarket Station and North Station there is also a surface branch line which terminates at Canal Street and Causeway Street. South of Haymarket, the Green Line generally runs parallel to the Orange Line through the downtown area, to the Back Bay area. Beyond Back Bay, the Green Line splits into four branches. Service is generally provided from



MBTA Subway Line
Subway Under Construction
Subway Station
MBTA Bus Route

Figure 9
Public Transportation Facilities

0 ¼ ½ 1 Mile

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

5:00 AM to 1:00 AM, with headways being comparable to those offered by other MBTA rapid transit lines. The MBTA is considering options to upgrading its transit and commuter rail facilities in the North Station area, in conjunction with the Boston Redevelopment Authority's Urban Renewal Plan. At the time of this writing (1984), a preferred alternative had not been selected.

The MBTA also provides local bus service within both East Boston and South Boston. In East Boston, there are four such routes (Routes 116, 117, 120, and 121). Routes 116 and 117 begin at Maverick Station and terminate at Wonderland Station in Revere; Route 120 runs between Maverick and Orient Heights Stations; and Route 121 operates between Maverick and Wood Island Stations.

Within South Boston, the MBTA operates five local bus routes (Routes 6, 7, 9, 10, and 11). Route 6 connects the Boston Army Base with Haymarket Square; Routes 7 and 11 connect the City Point area of South Boston with downtown Boston; Route 9 begins at City Point and terminates at Copley Square in Boston's Back Bay; and Route 10 runs from City Point to the MBTA Orange Line's Dudley Station in Roxbury. The Summer Street and Broadway Bridges across the Fort Point Channel are used by the bus routes connecting South Boston and downtown Boston.

Numerous bus routes terminate at Haymarket Station, a major surface bus terminal. Bus Routes 92, 93, and 111 use local streets through Charlestown and City Square to arrive at the Haymarket terminal or downtown Boston destinations. Bus Routes 325, 326, 353, 354, and 426 enter Boston via Interstate Route 93 on the Mystic-Tobin Bridge and use the Haymarket exit from the Central Artery to enter the Haymarket terminal or continue to other downtown destinations. Bus Route 350 enters Boston via the Longfellow Bridge.

Private carrier bus routes operated through the study area include longer-distance routes serving communities in northeast Massachusetts, New Hampshire, Maine, and Vermont. These services are provided by Greyhound, Trailways, and Trombly Motor Coach, among others.

At Logan Airport, several forms of surface public transportation are available. Massport operates bus service which connects the MBTA's Airport Station on the Blue Line with the airline terminal buildings using the Airport's loop roadway system; a separate segment of this service circles among the terminals without stopping at the MBTA station, using a portion of the access roadway system. Except for the private automobile, taxis are the most prevalent mode of ground transportation service provided at Logan Airport.

Limousine service to and from the Airport is also available to numerous outlying areas in Massachusetts and New Hampshire and to downtown Boston hotels. Scheduled common-carrier bus service is also offered to a number of locations in Massachusetts, Rhode Island, and Vermont. Taxis, limousines, bus, and automobile rental traffic account for approximately 32 percent of the passenger vehicle trips generated by the airport.

In addition to Logan Airport, another major transportation complex within the project area is South Station. Amtrak trains depart from this terminal throughout the day for points along the Northeast Corridor as far as Washington, DC, and to Chicago. The MBTA operates five commuter rail lines from South Station to Attleboro, Stoughton, Franklin, Framingham and Needham. Extensive commuter and long-distance bus service is also available from the South Station area. From North Station, the MBTA operates five commuter rails to Rockport, Ipswich, Haverhill, Lowell, and Gardner. All routes operate seven days per week with reduced service on Saturdays and Sundays.

Commuter ferry service within oston Harbor is also provided by hree private companies. The Bay tate - Spray & Provincetown Steamship o. provides one round trip between ull and Boston on weekdays, leaving emberton Pier at 7:20 AM and eturning from Boston's Long Wharf at :30 PM. Trip time is approximately 0 minutes. Massachusetts Bay Lines, nc. offers one round trip between the ingham Shipyard and Rowes Wharf in oston, with a trip time of pproximately 55 minutes. Their essel leaves Hingham at 7:20 AM and oston at 5:20 PM. Finally, assachusetts Bay Commuter Services, nc. schedules eight round trips on eekdays between the Hingham Shipyard nd Rowes Wharf using a new high-speed hip called the "Gracious Lady." From ingham, the first trip is scheduled o leave at 7:00 AM, with the last rip of the day departing Hingham at :10 PM. From Boston, the day's first eparture to Hingham occurs at 7:30 AM nd the last trip leaves for Hingham at 7:10 PM. Scheduled trip time is approximately 25-30 minutes.

Future development proposals in the area are expected to result in increased traffic demand and subsequently increased public and private transit usage. Projections of future ground traffic generated by activities at Logan Airport, without construction of a Third Harbor Tunnel, indicate an approximate 40 percent increase over existing ground traffic. At South Station, the amount of bus service will increase significantly in the future when Greyhound and its affiliated companies relocate their operations to the proposed South Station Transportation Center, now under construction. The Commonwealth is also promoting increased ferry service.

3.2 LAND USE

This section briefly describes land use in the following districts: South End; Industrial Triangle; South Boston; Leather District; Chinatown/South Cove; Fort Point Channel; Financial District; Waterfront; Government Center; North End; North Station; West End; East Boston; Logan Airport; Route 1A North; and Charlestown. These districts are shown on Figure 10. Major land uses in each area are listed in Table 5, are presented on Figures 11, 12 and 13, and are described in the following subsections.

3.2.1 Overview

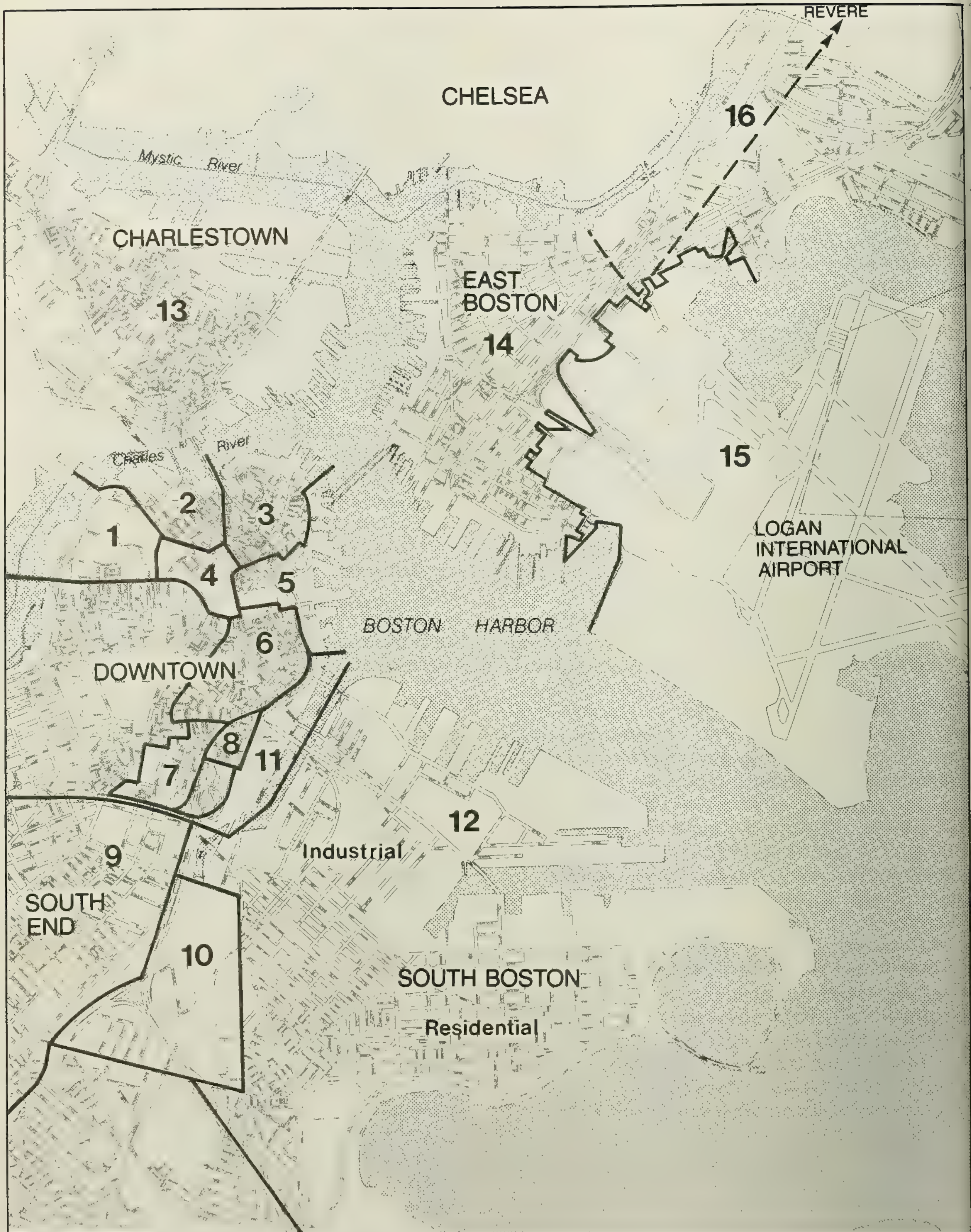
The project area contains a diversity of land uses. The Fort Point Channel area, Leather District, Financial District, Government Center and North Station areas house public and private offices, commercial and retail activities, transportation uses, and entertainment facilities; these areas have very small residential populations.

Predominant activities in northern South Boston are manufacturing, warehousing and food distribution activities. The southern half of South Boston is a large residential community.

The South End, Chinatown/South Cove, the Waterfront, the North End and the West End are significant downtown residential neighborhoods, with a variety of other land uses.

Primary land uses in the Industrial Triangle and Route 1A North are light manufacturing, wholesaling and distribution, and storage and maintenance of transportation equipment.

The Central Artery is a significant land use component of downtown Boston. The structure of this highway in many instances defines the edges of neighborhoods, and land uses on either side of the Central Artery are quite different. In some cases the physical presence of the Artery has slowed changes which were encouraged by the city; for example, the development of the waterfront south of the Harbor Towers. In other areas, the Central Artery is perceived and commonly cited as protecting the character of an area; for example, in



1 - West End
2 - North Station
3 - North End
4 - Government Center
5 - Waterfront
6 - Financial District
7 - Chinatown/South Cove
8 - Leather District
9 - South End
10 - Industrial Triangle
11 - Fort Point Channel
12 - S. Boston
13, 14, 15 - Identified on Map
16 - Route 1A North

Figure 10
Neighborhoods in the Project Area

0 800 1600 3200 Feet

EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Artery

Table 2

SOUTH END (See Figure 11)

Existing Uses

1. Cathedral Sq. Housing Project
2. Castle Sq. Apartments
3. Boston Univ. Medical/Dental Center
4. Boston City Hospital
5. Boston Flower Exchange
6. Boston Herald American
7. New England Nuclear
8. Teradyne Company
9. Stride-Rite Corporation
10. Digital Equipment Corp.
11. MBTA Bus Storage/Maintenance
12. Crosstown Industrial Park

Future Uses

13. Hotel/Office Building

INDUSTRIAL TRIANGLE (See Figure 11)

Existing Uses

1. New Boston Food Market
2. Expressway Consolidated Group
3. Massachusetts Wholesale Food Market
4. Southampton Street Businesses
5. Dorchester Avenue Industries
6. Boston Public Works Garage
7. MBTA Cabot Yards
8. Boston Incinerator (Public Works)
9. Boston Traffic and Parking Dept. Operations Center
10. Boston Fire Department Headquarters and Garage
11. Boston Service Facility

SOUTH BOSTON (See Figure 11)

Existing Uses

1. Dockside Place (condominiums)
2. Temporary housing for Navy personnel
3. Small commercial buildings
4. 303 Congress Street (offices)
5. Stone & Webster Engineering Corporation (offices)
6. Neptune Lobster Company
7. Anthony's Pier 4 Restaurant, Piers 1-4
8. Fish Pier
9. Pier Grill
10. Fargo Building (U.S. Government Offices)
11. McKie Lighter Company (industrial)
12. The Gillette Company (manufacturing)
13. Mixed-use industrial area
14. Lindenmeyer Paper Company
15. Boston Plate and Window Glass
16. New England Seafood Center
17. Paul's Lobster Company, Stavis Seafood
18. Noymer, Inc. (manufacturing)
19. Harding Company (manufacturing)
20. Pier Transmission
21. Boston Harbor Industrial Park
22. Boston Marine Industrial Park
23. Conley Marine Terminal
24. Boston Tea Party Ship Museum
25. Children's Museum
26. Our Lady of Good Voyage Chapel
27. U.S. Postal Service parking
28. CONRAIL Track
29. South Boston Army Base
30. North Coast Seafoods, Inc.
31. Araban Coffee
32. Pappas Industrial Building
33. Mixed commercial uses
34. Turner Fisheries
35. Commercial Union Insurance Company
36. Caribou Fisheries
37. Northern Avenue Bridge
38. Former Penn Central Parcel (offices)
39. Boston Wharf properties (offices, residential)
40. 249-259 A Street (artists' studios)
41. Commonwealth Pier, BOSCOM (commercial)
42. Commonwealth Flats (light industrial, offices)
43. Massport Marine Terminal

FORT POINT CHANNEL (See Figure 11)

1. Stone and Webster Corp.
2. Federal Reserve Bank
3. Harbor Plaza
4. Hook Lobster Company
5. Russia Wharf
6. South Station Transportation Center
7. South Postal Annex
8. Boston Edison Kneeland St. Generating Plant (proposed Wang Corp. development)
9. Boston Edison Substation
10. MDC Combined Sewer Overflow Treatment Facility (proposed)
11. MBTA Wye Connector (proposed)
12. MBTA (Old Colony) Railroad Bridge
13. Appraisers Stores Renovation
14. Bain Building
15. Rowe's and Foster's Wharves

LEATHER DISTRICT (See Figure 11)

1. Essex Hotel
2. Teradyne Company
3. Dewey Square Office Tower

CHINATOWN/SOUTH COVE (See Figure 11)

1. Mass. Pike Towers
2. Tai Tung Village
3. Quincy Tower
4. Tufts-New England Medical Center

FINANCIAL DISTRICT (See Figure 12)

Existing Uses

1. Devonshire Towers (residential)
2. Blue Cross/Blue Shield Building (offices)
3. 155 Federal Street (offices)
4. Fiduciary Trust Building (offices)
5. Trailway's Bus Station
6. Keystone Building (offices)
7. High Street Garage
8. New England Telephone (offices)
9. Western Union Building (offices)
10. The Travelers' Building (offices)
11. State Street Bank Building (offices)
12. Meridien Hotel
13. Batterymarch Building (offices)
14. 88 Broad Street (offices)
15. Small mixed-use buildings
16. Grain Exchange (offices)
17. Wharf buildings (offices)
18. 40 Broad Street (offices)
19. 33 Broad Street (offices)
20. One Liberty Square (offices)
21. One Post Office Square (office tower)
22. 53 State Street (office tower)
23. 60 State Street (office tower)
24. Downtown Crossing (Filene's, Jordan Marsh, Lafayette Place, etc.)
25. Shawmut Bank Building (offices)
26. Bank of Boston (offices)
28. [illegible]
29. Fort Hill Fire Station
30. Fort Hill Garage
31. John McCormack U.S. Post Office and Court House
32. Angell Memorial Park
33. Kilby Street Garage
34. Old South Meeting House
35. Custom House Tower (offices)

Future Uses

36. Fort Hill development site (offices)
37. Essex Street development corridor (offices)

WATERFRONT (See Figure 12)

Existing Uses

1. Harbor Towers (condominiums)
2. Mercantile Wharf Apartments
3. Christopher Columbus Plaza (elderly housing)
4. Ausonia Apartments (elderly housing)
5. North End Community Nursing Home
6. Faneuil Hall Market Place
7. Bostonian Hotel
8. Haymarket (open air market)
9. Long Wharf Marriott Hotel
10. New England Aquarium

Future Uses

11. Parcel D-10 (retail, offices)
12. Blackstone Block rehabilitation (retail, offices)
13. Sargent's Wharf (residential)
14. MBTA Powerhouse (residential)

GOVERNMENT CENTER (See Figure 12)

Existing Uses

1. Bank of New England Building (offices)
2. Commercial office buildings
3. Sears Crescent (offices)
4. New England Telephone - Bowdoin Square Building (offices)
5. Commercial office buildings
6. Jewish Social Services Building
7. Boston City Hall
8. Veteran's Administration Outpatient Clinic
9. City Hall Plaza
10. John F. Kennedy Federal Building (offices)
11. Boston Police Station, District A
12. Government Center Parking Garage
13. Mass. Dept. of Social Services
14. State Service Center (Hurley Building and Lindemann Center)

Future Uses

15. Parcel 7 (hotel, retail)
16. New Chardon/Merrimac Street parcel (future use unknown)

NORTH END (See Figure 12)

Existing Uses

1. Casa Maria (elderly housing)
2. Thatcher Street Housing
3. McLaughlin Building (condominiums)
4. Battery Street Condominiums
5. Salem, Hanover and connecting streets (retail and restaurants)
6. 77 North Washington Street (commercial)
7. 123 North Washington Street (offices)
8. Copps Hill Cemetery
9. Old North Church and Museum
10. Paul Revere House
11. U.S. Food and Drug Administration
12. Coast Guard Support Center

Future Uses

13. Waterfront Terraces (residential)

NORTH STATION (See Figure 12)

Existing Uses

1. Boston Garden
2. Anelex Building (offices)
3. Atlantic Lobster Building
4. Hoffman Building (offices)
5. H. W. Powers Factory Store
6. Francesco's Italian Restaurant
7. Joey's Auto Village
8. Braman, Dow and Company (manufacturing)
9. New England Store Fixtures (warehousing)
10. Keany Square Building (manufacturing)
11. Stop and Shop Bakery
12. Charles River Building (manufacturing, offices)
13. Boston Edison Steam Plant
14. Spaulding Rehabilitation Hospital
15. Mass. Registry of Motor Vehicles/Dept. of Public Works
16. MDPW helicopter pad
17. North Station Commuter Rail Terminal
18. General Services Administration Federal Building
19. MBTA Electric Substation
20. Charles River Dam and Locks

Future Uses

21. MBTA Substation
22. Parking Garage
23. Office Building
24. New Arena
25. Mainland development site, BRA Sub-Area II (hotel, retail)
26. Canal and Island development site, BRA Sub-area II (residential, institutional)
27. Relocated MBTA Green Line and Commuter Rail Facilities

WEST END (See Figure 12)

Existing Uses

1. Amy Lowell House (elderly housing)
2. Charles River Park (residential)
3. The Blackstone (elderly housing)
4. Holiday Inn
5. Charles River Plaza (retail)
6. 50 Staniford Street (offices)
7. Massachusetts Eye and Ear Infirmary
8. Massachusetts General Hospital
9. Shriners Burns Institute
10. Harrison Gray Otis House
11. Suffolk County Jail

Future Uses

12. Charles River Park parcel (future use unknown)

EAST BOSTON (See Figure 11)

Existing Uses

1. Victory Gardens
2. Bethlehem Steel (currently vacant)
3. Maverick Housing Development
4. Heritage Apartments
5. Central Square shopping area
6. Maverick Square shopping area

Future Uses

7. Massport Piers 1-4
8. George Page Hotel
9. Holiday Inn
10. NDP II residential development
11. Lyman School apartments
12. Maverick Square Post Office

LOGAN INTERNATIONAL AIRPORT (See Figure 11)

Existing Uses

1. Eastern Airlines Terminal
2. Eastern Airlines Fuel Farm
3. Eastern Airlines Cargo Building
4. Hill Cargo Building
5. Eastern Airlines Hangar
6. Van Duesen/Air Associates
7. Eastern Airlines Reservations Center
8. General Aviation Building
9. Emery Air Cargo Building
10. U.S. Postal Service Airmail Facility
11. National Car Rental
12. Dollar Car Rental
13. Avis Car Rental
14. Hertz Car Rental
15. United Flight Kitchen
16. Central (Williams) Cargo Building
17. Pan Am Cargo Building
18. Airport Exxon Station
19. Delta Reservations Center
20. Robie Airport Park
21. Bird Island Flats Mixed Use Development
22. Bird Island Flats Air Cargo and General Aviation Facilities
23. ABC Air Freight
24. Hilton Hotel

ROUTE 1A NORTH (See Figure 13)

Existing Uses

1. Suffolk Downs Racetrack
2. Wonderland Racetrack
3. Ramada Inn
4. Car Rental (3 firms)
5. Fuel Tank Farms
6. Structural Steel Fabricating Plant
7. P & L Sportswear
8. Towle-Leonard Factory

the North End.

East Boston is primarily residential, with some commercial and retail activity. Sections of East Boston contain airport-related uses such as car rental, parking and freight forwarding.

Logan Airport is a full service national and international facility with a full complement of freight forwarding, car rental, hotel and air transport land uses.

Two parallel shipping channels are maintained in Boston Harbor, one of 35 feet and one of 40 feet. The Army Corps of Engineers maintains the channels.

3.2.2 South End

The South End contains several socially distinct residential neighborhoods lying mostly to the west of Harrison Avenue. These consist largely of older row houses and newer, multi-family developments.

The South End's central location, good highway access, and inexpensive land and building space are the basis of its economic activity. An industrial and institutional corridor lies along the Central Artery/Southeast Expressway/Albany Street. Activities in the industrial corridor include light manufacturing, wholesaling, distribution, and warehousing. Industrial uses are located both in older, often rehabilitated structures, of 5 to 6 stories, and in new low-rise buildings. There are several new multi-story industrial buildings, such as that of New England Nuclear on Albany Street. Most of the smaller businesses have been in their current location for over 20 years. New high tech firms entering the area occupy new or substantially renovated facilities.

Major land uses in the area are shown on Figure 11 and listed in Table 5, and include two major hospital complexes, Boston City Hospital and the Boston University Medical Center.

There are approximately 1,015,000 square feet of industrial building space in this area. Retail, commercial, and institutional activities occupy approximately 613,000 square feet.

The South End's older industries tend to serve a regional market area largely by truck (approximately 4300 truck trips per week). The newer, high-tech and bio-medical industries require good, primarily automobile, access to the airport and downtown areas.

Retail, commercial, and institutional activities generate 2100 truck trips per week. The two major hospitals, the principal employers in the area, serve the entire region and benefit from their central location with good highway and reasonable airport access.

The future of the South End may include continued growth in the institutional, high-tech, and bio-medical industries, and in associated commercial development. However, the older, established industries and commercial businesses anticipate little future expansion. It is likely that truck trips will continue to be generated by a few major sources.

3.2.3 Industrial Triangle

This area includes the industrial lands lying between the Southeast Expressway, the West Fourth Street Bridge, Dorchester Avenue, and Southampton Street (see Figure 10). The industries in the 230-acre area include warehousing, food and freight distribution, wholesale suppliers, and public garage and maintenance facilities; all are uses dependent on good truck access to the regional highway network. The area houses approximately 1,180,000 square feet of space, mostly in large distribution or warehouse facilities.

Major facilities in the area

are shown on Figure 11 and listed in Table 5.

The area generates large volumes of highway-dependent traffic, both truck and auto; there are approximately 10,000 truck trips per week, and most of the area's 3150 employees drive to work. Despite localized areas of congestion and heavy rush hour traffic, the Industrial Triangle's central location and proximity to regional highways give it excellent access for the regional distribution system which is the basis of its economic activity.

Companies in the Industrial Triangle are to some extent interdependent, with substantial truck volumes circulating between the food distribution centers near Southampton Street and Widett Circle via the Frontage Road, Albany Street, and Central Artery.

The one proposal in the area for future development is the Boston Service Facility, an improvement project by Amtrak at the Cabot Yards, Yard 5, and the Southampton Yards. The project is under way and ultimately, tracks will be lowered, and inspection, maintenance, and office facilities will be built. A surface parking lot for 250 cars is planned. Access to the improved yards will be from Frontage Road and Southampton Street.

No private development plans have been identified in the Industrial Triangle.

3.2.4 South Boston

South Boston is a 2400 acre peninsula connected to Boston by ten bridges across Fort Point Channel and the railroad tracks west of Dorchester Avenue. South Boston includes residential neighborhoods, heavy industry, warehousing, transportation facilities, and a large, historically significant park at Castle Island.

South Boston can be divided into two distinct areas of nearly equal size: the northern industrial section, and the southern residential section. The division of these areas occurs approximately at First Street (see Figure 10). A smaller industrial area lies between Old Colony and Dorchester Avenues.

Land use in the southern section is predominantly residential, with some retail and commercial activities aimed primarily at local residents with neighborhood business districts along West Broadway and East Broadway. Major facilities in the area are shown on Figure 11 and listed in Table 5.

The northern section of South Boston is one of the city's largest industrial areas. The majority of land in this area is owned by Massport and the Economic Development and Industrial Corporation of Boston (EDIC), with several major parcels leased to private businesses.

Industrial uses include trucking, warehousing and distribution, marine industries, fuel farms, and power plants. There are also a growing number of office buildings in the area and several commercial and retail establishments. These activities are located in South Boston because of its port facilities, large areas of relatively inexpensive land, and proximity to downtown Boston.

The area immediately to the east of the Fort Point Channel contains a mix of land uses and is slowly changing from an industrial to a commercial and residential area. There are approximately 100 existing residences near Fort Point Channel; these include both developer-financed condominiums and artists' lofts. In addition there are many small businesses, including light industrial, commercial and office establishments in this area. The Gillette Company, a research and manufacturing firm with 3,200 employees, occupies a 29-acre site near the Fort Point Channel.

The Boston Wharf Company has

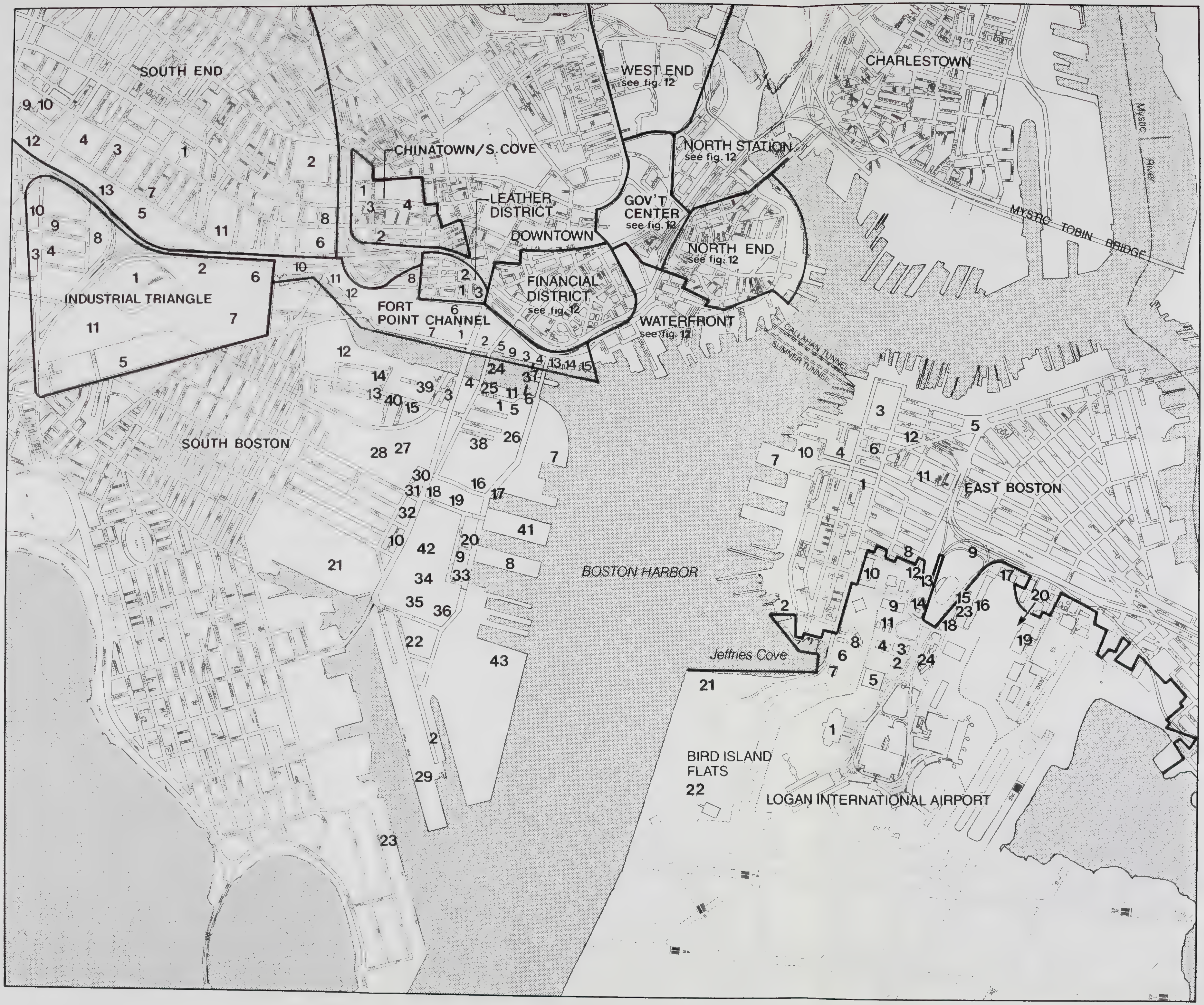


Figure 11
Major Land Uses – I

0 450 900 1800 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Cent

Legend
— Neighborhood Boundaries
1 Land Uses Identified in Text

Figure 12
Major Land Uses – 2

0 350 700 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

Legend

1 Land Use Identified in Text

Neighborhood Boundaries

substantial land holdings in this area and plans residential and office development. Stone & Webster Engineering Corporation is converting a warehouse structure into office space for 900 employees. Cabot, Cabot & Forbes plans to develop former Penn Central properties into a major office site. Piers 1-4, owned by Anthony Athanas, are the proposed site for 1.7 million square feet of offices, two hotels, residential development and a major marina.

Massport is a major land owner in South Boston. Plans for Massport property include a Computer Trade Center on Commonwealth Pier (BOSCOM) and nearby parcels; long-range plans for light industrial and office use on Commonwealth Flats; expansion of fish processing on the Fish Pier; and a container port at the Massport Marine Terminal, under lease from EDIC. The Boston Marine Industrial Park, a 101 acre area to the east of the Fish Pier (formerly the South Boston Naval Annex), is also under EDIC jurisdiction, and contains industrial and marine-related uses. Across the Reserve Channel and to the east of Commonwealth Flats is the Castle Island industrial area, including the White Fuel storage and fuel transfer facility, a major generator of hazardous cargo truck traffic.

Another distinct land use area within South Boston is the South Cove area, which lies southwest of the Dorchester Avenue Bridge. The South Cove contains railroad tracks and storage, MBTA property, vacant parcels, and the back end of Fort Point Channel.

3.2.5 Fort Point Channel

Fort Point Channel is located between Boston and the northern section of South Boston. The land lying between the Channel and Atlantic Avenue is described as the Fort Point Channel area. The area which lies to the east of the Channel was described above as part of South Boston. Major facilities are shown on Figure 11 and listed in Table 5.

The South Station area is occupied mostly by large public facilities, including several transportation facilities undergoing renovation. Over 3.5 million riders each year use the railroad and commuter rail facilities at South Station. The South Postal Annex, Boston's central mail distribution facility located adjacent to South Station generates 900 truck trips per week and employs 4,500 people at this facility. Also located in the area are the Trailways bus station, and MBTA subway car storage.

Until recently the Boston side of Fort Point Channel was dominated by warehouses and vacant land used for parking. Recently, the area has been the site of significant office development; from the Harbor Towers complex to the Stone and Webster building on Summer Street, the area is almost entirely devoted to professional office space, reflecting its location on the periphery of the Financial District. (Although the Central Artery west of Atlantic Avenue remains a barrier to the downtown Financial District, its influence as a dividing line has declined as more office buildings have been built or renovated east of it.) A small number of retail establishments serving office employees are located on the ground floors of several office buildings. Approximately 12,000 employees work in over 3 million square feet of office space; many of them park across the Fort Point Channel in South Boston.

The Channel area, a potential National Register Historic District, has been the focus of several marine oriented recreational land use concepts. The Boston Harbor Associates, Boston Educational Marine Exchange, Boston Conservation Commission, Sierra Club, and other groups have presented concept plans or voiced support for such plans. Access problems and poor water quality have hampered revitalization of the area, particularly for recreational uses. The Channel has a navigable 20-foot channel which is usable as far as the Congress Street Bridge. Neither the

ongress nor Summer Street Bridges can e opened to allow boats to go further nto the Channel.

.2.6 Leather District

The Leather District is a nine lock area of mostly five- and ix-story brick loft structures built n the 1880's. It is located one lock west of Fort Point Channel.

Major land uses in the area are hown on Figure 11 and listed in Table , and include office, warehousing, anufacturing and commercial; there ave also been some conversions to esidential use. Manufacturing uses nclude the Teradyne Co., an lectronics firm with approximately 50 employees, and several small firms erving the restaurant industry in earby Chinatown. Commercial uses nclude warehousing, office space, and rtists' studios. Office space in the rea increased by nearly one million quare feet with the recent completion f the Dewey Square Office Tower to ver 1,300,000 square feet.

Land use in the area is hanging, from the traditional eather- and garment-oriented firms till occupying space in the district o a variety of newer businesses for which multi-story space is suitable nd proximity to downtown is mportant. Proximity to South Station s an additional benefit. Renovation of the existing structures has started, and will almost certainly continue over the next twenty years.

The District's historic status is both an amenity for office uses and a source of investment tax advantages.

Infill development (development on scattered vacant lots) and some redevelopment is likely; property values and employment are expected to increase. Trends indicate that future land use will probably be a mixture of residential, commercial, office, and light manufacturing uses.

3.2.7 Chinatown/South Cove

Chinatown/South Cove is a predominantly Chinese residential neighborhood within a light industrial district. Major institutional and commercial uses are also located in the area. Buildings are typically four- to seven-story warehouses and older, medium-rise office buildings. Housing units are concentrated in three large towers and in a number of three-story brick row houses. The Tufts New England Medical Center is a major institutional land use in the district.

Businesses located in the area are strongly linked to the Chinese community, both as a source of labor in the garment industries and as the primary patrons of the area's retail businesses. Clothing manufacturing, the major industrial use in this neighborhood, takes place in a number of small firms along Kneeland Street. The area to the north of Kneeland Street is primarily commercial, containing restaurants, import-export firms, and several Chinese-language movie houses. South of Kneeland Street the area is primarily residential and institutional, with a small number of retail establishments, chiefly food stores, geared to the local market. Major facilities are shown on Figure 11 and listed in Table 5.

South of Kneeland Street most development activities are being initiated by Tufts University. Tufts has recently acquired two buildings occupied by garment manufacturers which it plans to convert to institutional uses. A new Tufts library is also planned. The institutional facilities have little interaction with the other businesses in the district apart from providing restaurant patrons.

The BRA is trying to encourage the construction of residential buildings in Chinatown/South Cove.

North of Kneeland Street, however, former garment industry buildings are being converted to commercial space by private property owners.

3.2.8 Financial District

The Financial District lies between Boston's downtown retail district to the west and the Central Artery to the east. It is the banking and financial center for the Boston metropolitan area and, to a large extent, for New England. The Financial District covers approximately 40 square blocks and consists of multi-story office buildings, with first floor retail activities.

The Financial District comprises two fairly distinct zones separated by the High Street exit ramp from the Central Artery. Major land uses are shown on Figure 12 and listed in Table 5.

One area, centered on Federal and Franklin Streets, is composed of new high-rise buildings occupied primarily by banking, insurance and related firms. Continued development of new office towers and renovation of existing buildings is occurring in this area. The largest development site is the Fort Hill Garage site, where one to two million square feet of office space is under construction. This zone also includes the new Meridien Hotel and Devonshire Towers, the first residential development to occur in the Financial District.

The second area, centered around Broad Street, is characterized by five- to six-story buildings and an irregular street pattern. The Broad Street area was originally laid out by the architect Charles Bulfinch and contains many attractive commercial buildings from succeeding periods. The Custom House National Register Historic District is located within this area and includes State Street, the original main street of commercial Boston. Significant recent rehabilitation has taken place in this area, and many of the older buildings now house prime office space. Two 25-story office buildings are currently under construction near the intersection of Franklin and Oliver Streets.

Downtown Crossing, Boston's retail core, is adjacent to the Financial District. Lafayette Place, a major retail and hotel development with about 225,000 square feet of retail space, opened in 1984.

3.2.9 Waterfront

The Waterfront area contains commercial, office and residential uses. Faneuil Hall Market Place and the New England Aquarium draw substantial tourist traffic to the area. Renovation activities began in 1964, when the Waterfront was designated as an urban renewal area. Waterfront property is now extremely valuable, and most recent development has focused on luxury commercial and residential markets. See Figure 12 and Table 5.

West of the Central Artery the district is occupied by Faneuil Hall Market Place and the Blackstone Block. Buildings are primarily historic three- to five-story brick or granite structures. Faneuil Hall Market Place attracts 12 million visitors per year and is a major retail center. Adjacent to the Market is Boston Redevelopment Authority (BRA) Parcel D-10, a surface parking lot currently being developed for office and retail uses. Recent developments in the area include the 153-room Bostonian Hotel and a 680-car garage. The Haymarket area along Blackstone Street houses fresh food specialty shops, and is the site of an open air market on Fridays and Saturdays. A pedestrian underpass crossing under the Central Artery links Haymarket with the North End.

The area lying between North Street, the Central Artery and Atlantic Avenue is composed of four- to six-story brick and granite buildings which are primarily residential. Two large housing

evelopments for the elderly and a ursing home serving North End esidents are also located in this rea.

East of Atlantic Avenue are a eries of wharves occupied by ommercial, office and residential ses. Cruise, ferry and private boats ock at a variety of wharf locations. hristopher Columbus Park is a large ark heavily used by Boston residents nd tourists. The buildings on the harves south of Long Wharf (State treet) are relatively new, and nclude the Harbor Towers condominium uildings and the New England quarium. South of Harbor Towers is he Rowes/Fosters Wharf, now being eveloped with office, retail and esidential uses.

North of Long Wharf, and ontinuing to Union Wharf, the wharf uildings are mostly three- to our-story 19th century granite arehouses which have been converted o commercial, office and luxury esidential space. Further to the orth, non-residential uses, including he Bay State Lobster Company, urrently predominate. Two esidential development sites are nder preliminary discussion: Sargent's Wharf, owned by the BRA, and an MBTA Powerhouse being considered for rehabilitation as low-cost housing by a non-profit developer.

3.2.10 Government Center

Government Center contains the majority of the City of Boston's public offices, the major Federal office buildings in Boston, and a number of State and County offices. The functional area of Government Center extends across Cambridge Street to include the Suffolk County Courthouse and several State office buildings. In addition to government offices, there are several large private office buildings, parking facilities, and small shops and restaurants which serve the area's workers. There are no residential structures in the district.

The physical layout of the area is quite different from most of Boston, with wide, heavily travelled streets bordering large "superblocks." The most significant landmark in the area is City Hall Plaza, which is both the major pedestrian circulation space in the district and the site of public demonstrations, performances, and city events. Major uses are shown on Figure 12 and listed in Table 5.

Boston City Hall, the State Service Center and the JFK Federal Office Building draw a great number of visitors to the area each day. Limited parking facilities cause many people to use public transportation; the Government Center MBTA Station serves area employees, people making business trips, and a significant number of tourists visiting the historic downtown and Waterfront areas.

There are two publicly-owned vacant development parcels in this area: BRA Parcel 7, and the parcel at the intersection of Merrimac and New Chardon Streets.

3.2.11 North End

Directly north of the Waterfront and bounded by the Central Artery, North Washington Street and Boston Harbor lies the North End, one of Boston's oldest neighborhoods. Although separated from downtown Boston by the Central Artery, the North End is within walking distance of Faneuil Hall, Government Center, and the Financial District. Much of the North End is only a short walk from major public transportation services at Haymarket, Government Center and North Station (Green Line, Orange Line, Blue Line, Commuter Rail, bus).

The North End is architecturally homogeneous, with three- to five-story brick buildings lining narrow streets. It is largely residential, but also houses a significant commercial district consisting of small shops and

restaurants on the ground floors of residential buildings. The district is a major regional center for ethnic shopping, serving the large Italian-American population of metropolitan Boston. See Figure 12 and Table 5 for identification of major land uses in the area.

Housing is the primary land use in the North End. At one time, the housing stock consisted primarily of rental units, but there are an increasing number of condominiums. The major commercial section of the North End is located around Hanover and Salem Streets.

Thousands of tourists visit the North End each year to follow the Freedom Trail past Paul Revere's house, the Old North Church and other historic sites.

Located on the periphery of the North End are larger businesses and institutions that are city-wide or regional in character. Expensive professional space has recently been developed on the eastern edge of the North End, essentially as an extension of the Waterfront district.

3.2.12 North Station

The North Station area lies between the Charles River, the Central Artery and Government Center. It contains retail, commercial, government, office, institutional and manufacturing uses (see Figure 12 and Table 5). Major facilities are the MBTA's North Station commuter rail terminal and transit facilities, the Boston Garden sports arena, the Anelex Building, the Massachusetts Registry of Motor Vehicles, the Spaulding Rehabilitation Hospital, and the West End Pussycat Cinema. Commercial, retail, manufacturing and office uses are concentrated along Causeway Street.

The Bulfinch Triangle lies south of Causeway Street between North Washington Street and Merrimac Street. Its three- to nine-story brick buildings contain primarily manufacturing, commercial and warehousing uses. Private rehabilitation of buildings in this 19th century industrial district is ongoing.

The North Station area presently contains a great deal of land used for surface parking; approximately 2,300 parking spaces exist. Roughly 60 percent of these are designated employee parking for the Massachusetts Department of Public Works, Massachusetts General Hospital, and the Spaulding Rehabilitation Hospital.

At this time, the Boston Redevelopment Authority (BRA) is undertaking a federally-assisted urban renewal project in the North Station area. Recent planning studies have divided the area into three sections: Railyard and River Edge; North Station/Boston Garden Area; and Bulfinch Triangle. Redevelopment is currently in progress for the North Station/Boston Garden section (BRA Phase I), including construction of a major General Services Administration (GSA) Federal Office Building. Other potential improvements in this area include relocation of the MBTA Green Line transit facilities; construction of a new Boston Sports Arena or other facility above extended MBTA commuter rail tracks; construction of a parking garage adjacent to Lomasney Way and the elevated Storrow Drive/Central Artery Connector Ramps; and discontinuance of a portion of Nashua Street (part of the GSA project). Construction of these improvements is expected to continue over the next decade. Planning is under way for the Railyard/River Edge section (BRA Phase II). Construction of any improvements in this section are not anticipated until 1990 or later.

The new Charles River Dam has two recreational and one commercial lock which allow access into the Charles River, whose 16-foot deep channel is maintained by the U.S. Army Corps of Engineers.

.2.13 West End

The West End lies between ɜacon Hill, the Charles River, and ɔvernment Center. Until the late ɜ50s, the West End was composed rimarily of early 20th century ive-story apartment buildings. These ɔw-rent buildings were razed in the arly 1960s during one of Boston's arliest and largest urban renewal rojects. The 45-acre site is now ccupied by Charles River Park, a evelopment consisting of eight igh-rise apartment towers, a ubsidized apartment tower for the lderly, an office building, a small ommercial building, a synagogue and hree parking garages. Landscaped aths wind through the development, nd no through streets cross the rea. See Figure 12 and Table 5 for ıajor area land uses.

South of Charles River Park, he area has primarily institutional ıses, including Massachusetts General lospital, Massachusetts Eye and Ear :nfirmary, the Suffolk County Jail and :wo churches. Charles River Plaza, a ɜhopping center along Cambridge ɜtreet, contains stores, movie :heaters, restaurants, a major hotel ınd a large privately-owned parking ırea.

There is one undeveloped parcel ıt Charles River Park at the intersection of Lomasney Way and Staniford Street; no proposals are ınder consideration at this time. The remainder of the West End is fully developed.

3.2.14 Charlestown

Existing conditions in Charlestown are described in the Final Environmental Impact Statement for U.S. Interstate Route 93 and U.S. Route 1 (Federal Highway Administration and Massachusetts Department of Public Works, 1979). Charlestown is a stable residential community. The housing stock is predominantly older, two- and three-story structures, with many multi-family and row houses.

Charlestown is also a major employment center, with industrial and warehousing activities located to the west of Interstate Route 93, along Rutherford Avenue, and along the Waterfront. Bunker Hill Community College is also located in Charlestown, north of the John F. Gilmore Bridge and east of Interstate Route 93. There are local commercial establishments along Bunker Hill Street and Main Street. Several historic sites, including the USS Constitution and the Bunker Hill Monument, attract visitors to the area.

3.2.15 East Boston

East Boston is primarily residential, with scattered retail activity serving local residents in Central Square, Maverick Square, along Meridian Street, and in first floor corner stores throughout the neighborhood. Industrial and commercial activities are found in Jeffries Point and in the area around the intersection of Bremen and Porter Streets.

Jeffries Point, a distinct neighborhood within East Boston, lies east of the Conrail railroad right-of-way, south of Logan's Southwest Service area and west of Jeffries Cove. It is primarily a residential area. Row houses and triple-deckers cover the hill between the airport and Marginal Street.

Most commercial uses in East Boston are predominantly airport-related. These include car rental agencies, parking lots, and freight forwarders. An airport-related commercial and industrial corridor parallels the Conrail railroad right-of-way and Route 1A through East Boston.

Business-related traffic to the airport is heavy. Businesses located in East Boston, off the airport but accessible to it, benefit from much lower site costs than on-airport competitors. Airport-related commercial uses have grown considerably in recent years and

pressure for future growth is likely to continue, constrained primarily by the lack of land with suitable access to the airport and the tunnels; property values for this type of land are likely to increase.

New residential and commercial development based on excellent views of the Harbor and Boston skyline has been proposed for waterfront sites. However, the market for such development is unproven, and its occurrence is uncertain. The Massport piers property on which new commercial development may occur is dependent on negotiations yet to be resolved between that agency, the community, and the BRA. The piers and other possible development sites are shown on Figure 11 and listed in Table 5.

3.2.16 Logan Airport

The project area includes portions of the Bird Island Flats development area, the Southwest Service Area, Central Area, and smaller portions of the Terminal Area and North Service Area (see Figure 11 and Table 5).

Activity at Logan Airport is related to airport passenger and cargo movements. Beyond these primary functions performed by the airlines, there are a range of airline-operated support activities, such as catering and maintenance, and several businesses oriented to airline passenger services, such as parking, car rental, concessions, and a hotel. Bird Island Flats is the site of the Massachusetts Technology Center. Phase 1 of the project, a building housing 180,000 square feet of high-tech, light-industrial uses, was completed in 1984. Phases 2 and 3, scheduled to be built over the next six years, include 237,000 square feet of office space, 308,000 square feet of light-industrial space, a 270-room conference center, and 1,030 structured parking spaces. An air cargo and general aviation facility is also being constructed on Bird Island Flats.

Passenger travel is forecasted to grow moderately over the next 20 years, but such forecasts are uncertain owing to basic changes in the air travel industry. Continued reliance on automobiles, including rental cars, as the primary access mode to the airport is likely.

Airport growth is likely to take place in an expanded terminal area; in new car rental and support facilities in the North and Southwest Service Areas; and on Bird Island Flats.

3.2.17 Route 1A North

This area consists of the land with frontage on Route 1A from Curtis Street in East Boston north to Bell Circle in Revere (see Figure 13 and Table 5).

Land uses are largely industrial or highway-oriented commercial, and most parcels are large, ranging upward from two to four acres. Some residential areas lie near the highway but are separated from it by differences in elevation of 10 to 30 feet.

Fuel storage, primary metals fabrication, and clothing manufacture are the principal industrial activities. Numerous airport and highway-related activities, such as freight forwarding, commercial parking, gasoline stations, hotels, and restaurants are located here as well. Two major attractions which together draw over 3 million people per year are Suffolk Downs Thoroughbred Racetrack and the Wonderland Dog Track.

Approximately 310,000 vehicle trips per week are made over Route 1A North. The commercial activity which occurs in this area is dependent on this traffic. There is very little interaction with the East Boston, Chelsea or Revere neighborhoods.

In the future, some infilling by industrial and airport-related uses such as freight forwarding operations

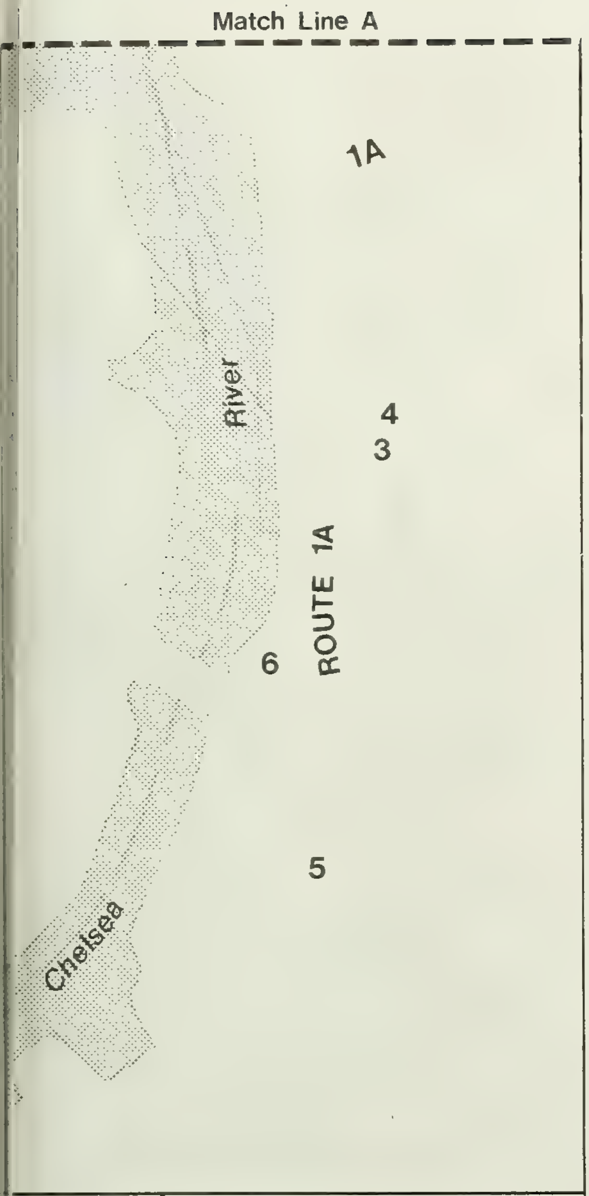


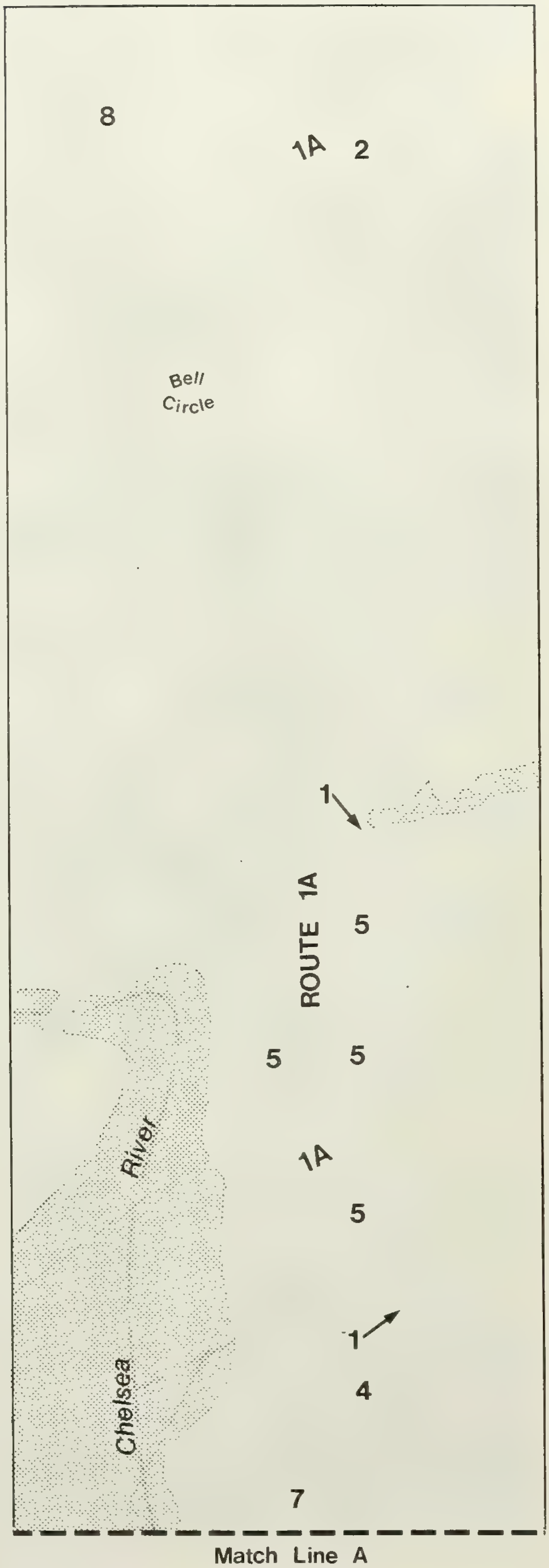
Figure 13
Route 1A North
Major Land Uses

0 250 500 1000 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

Legend

1 Suffolk Downs Race Track Entrances
2 Wonderland Race Track
3 Ramada Inn
4 Car Rental
5 Fuel Tank Farm
6 Bellesteel Fabricating Plant
7 P&L Sportswear
8 Towle-Leonard Factory



will probably occur in this area. There will be an emphasis on airport related uses by private interests.

3.3 NEIGHBORHOOD CHARACTERISTICS AND COMMUNITY FACILITIES

Neighborhood characteristics and community facilities in the neighborhoods lying closest to the tunnel alignment are described in this section. Major community facilities in these neighborhoods are listed in Table 6 and are shown on Figures 14 and 15. Neighborhood characteristics and major facilities are described below.

Primary sources of information on population and housing are U.S. Census of Population and Housing (1980), the 1979 Boston Redevelopment Authority (BRA) Household Survey and BRA Neighborhood Profiles.

3.3.1 South End

General Characteristics

The South End was developed between 1858 and 1875 on newly filled land as a single-family row house community for the relatively affluent. In the late 1800s, the neighborhood became a working class district of rooming houses and tenements and an enclave for immigrants. By the 1950s, population had started to decline rapidly, and in 1965 over 50 percent of the existing buildings were judged by the BRA to be in substandard condition.

Between 1950 and 1970 the total population of the South End decreased dramatically. The population of the South End in 1950 was 57,218; by 1960 the figure had declined 38.8 percent to 35,002. The South End suffered a further 35.2 percent population loss between 1960 and 1970, to a low of 22,680 people.

This trend was reversed in the years 1970-1980 when the South End population grew to 28,254, an increase of 25 percent. The proportion of the population under age 18 decreased from 27 percent to 22 percent, a decrease of 19 percent in share; while the proportion of the population over age 65 decreased from 17 percent to 12 percent, a 29 percent decline in share.

The total number of housing units rose by 25 percent between 1970 and 1980, and the vacancy rate dropped from 18 percent to 12 percent. Rental units made up 87 percent of the 1980 housing stock, a 4 percent drop from 1970. Home values more than tripled between 1970 and 1980, and rents more than doubled. The average 1980 home value was $67,143 and the average rent was $184 per month.

According to a 1980 BRA Household Survey, the South End population has a broad ethnic mix. Only 67 percent of the residents speak English at home, as compared to 85 percent for the City of Boston as a whole.

Project Study Area

The South End project area includes the area bordered by Herald Street, the Central Artery/Southeast Expressway, Massachusetts Avenue and Washington Street. Its neighborhood characteristics differ not only within the project area boundaries, but also as compared to the South End as a whole or Boston as a whole.

The South End project area encompasses an industrial corridor and two large public housing projects which contain 46 percent of the project area's population. In 1980, 73 percent of the housing units in Boston were rental units; the rate for the project area was 95 percent. The widespread renovations which are occurring in other parts of the South End are evident only to a very limited extent in the project area.

The population of the South End project area decreased seven percent between 1970 and 1980, although in the section between East Canton and West Concord Streets, where some renovation is taking place, the population

Table 6

MAJOR COMMUNITY FACILITIES IN THE PROJECT AREA (See Figures 15 and 16)

SOUTH END

1. Holy Trinity Roman Catholic Church
2. Cathedral of the Holy Cross Roman Catholic Church
3. Cathedral Grammar School
4. Cathedral High School
5. St. Helena's School
6. Hello House
7. South End Community Health Center
8. Pine Street Inn
9. Harrison Fire Station
10. Rotch Playground
11. Peter's Playground
12. Orange Line - Dover
13. Orange Line - Northampton

SOUTH BOSTON

1. St. Peter and Paul Roman Catholic Church
2. St. Vincent De Paul Roman Catholic Church
3. St. Augustine's Roman Catholic Church
4. The Albanian Orthodox Church of St. John The Baptist
5. Condon School
6. Gavin School
7. St. Augustine School
8. Cardinal Cushing High School for Girls
9. South Boston Community Health Center
10. D Street Fire Station
11. Boston Police Station 6
12. Boy's and Girl's Club of Boston
13. B Street/3rd Street Playground
14. Red Line - Broadway
15. Red Line - Andrew Square

CHINATOWN/SOUTH COVE

1. Quincy Community School
2. YMCA
3. Golden Age Center for the Elderly
4. South Cove Community Health Center
5. Tufts New England Medical Center
6. Pagoda Park
7. Tai Tung Park
8. Chinese Gateway
9. Orange Line - South Cove Station (opening 1986)

WATERFRONT

1. New England Aquarium
2. Christopher Columbus Park
3. Faneuil Square
4. Dock Square
5. Curley Memorial Plaza
6. Sp4 Robert Scibilia Memorial
7. MBTA Blue Line - Aquarium Station

GOVERNMENT CENTER

1. Boston City Hall
2. Veteran's Administration Outpatient Clinic
3. John F. Kennedy Federal Building
4. Boston Police Station, District A
5. Massachusetts Public Welfare Department
6. Massachusetts Department of Social Services
7. Jewish Social Services Building
8. Lindemann Mental Health Center
9. Massachusetts Department of Employement Security
10. Cardinal Cushing Memorial Park
11. MBTA Blue Line - Bowdoin Station
12. MBTA Green and Blue Lines - Government Center Station
13. MBTA Green and Orange Lines - Haymarket Station

NORTH END

1. St. Mary's Church
2. Old North Church
3. St. Leonard's Church
4. St. Stephen's Church
5. Sacred Heart Church
6. St. John's Parochial School
7. Christopher Columbus Catholic High School
8. Michaelangelo Junior High School
9. Eliot School
10. Hanover Street Post Office
11. North End Union
12. North End Branch Library
13. North End Community Health Center
14. Michael Nazarro Recreation Center
15. North Bennet Union
16. North End Neighborhood Services Center
17. North End Fire Station
18. The Haven (recreation)
19. Vincent Cutillo Playground
20. Private John DeFilippo Playground
21. Commercial Street Tennis Courts
22. MDC Sterriti Ice Rink
23. Senator Joseph Langone and Honorable Clementine Langone Sports Complex
24. Andrew Puopolo Playground
25. Copps Hill Terraces
26. Copps Hill Cemetery
27. Charles Street Playground
28. Paul Revere Mall

NORTH STATION

1. Boston Garden
2. Massachusetts Registry of Motor Vehicles/Department of Public Works
3. Spaulding Rehabilitation Hospital
4. MBTA Commuter Rail Station
5. MBTA Green and Orange Lines - North Station

WEST END

1. Charles River Synagogue
2. St. Joseph's Roman Catholic Church
3. Old West Church
4. Boston Public Library
5. Shriners Burns Institute
6. Massachusetts General Hospital
7. Massachusetts Eye and Ear Infirmary
8. Charles Street Jail
9. Charlesbank Playground
10. MBTA Red Line - Charles Street Station
11. MBTA Green Line - Science Park Station

EAST BOSTON

1. Our Lady of the Assumption Church
2. Most Holy Redeemer Church
3. Our Lady of Mt. Carmel Church
4. Sacred Heart Church
5. St. Mary Star of the Sea Church*
6. White Street Baptist Church
7. Our Saviour's American Lutheran Church
8. Samuel Adams School
9. Donald McKay School
10. Dante Alighieri School
11. James Otis School
12. Patrick J. Kennedy School
13. Hugh Roe O'Donnel School
14. John Chevrus School*
15. Joseph H. Barnes School
16. East Boston High School
17. Mario Umana School of Science and Technology
18. East Boston Central Catholic School
19. St. Mary Star of the Sea School*
20. St. Dominic Savio High School*
21. East Boston Police Station
22. East Boston Fire Station
23. East Boston Neighborhood Health Center
24. East Boston Area Planning Action Council
25. East Boston Social Centers, Inc.
26. Public Welfare Department Local Office
27. Department of Social Services Local Office
28. Harborside Community School
29. Porzio Park
30. East Boston Memorial Stadium
31. Paris Street Playground
32. Brophy Park
33. Sumner/Lamson Street Play Area
34. Blue Line - Maverick Square
35. Blue Line - Airport
36. Blue Line - Wood Island

* Shown on accompanying map of Route 1A North

Route 1A

Figure 14
Community Facilities – I

0 450 900 1800 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central

Legend
Neighborhood Boundaries
1 Community Facilities Identified in Text

increased by 43 percent. In 1980, 23 percent of the project area population was under age 18 and 15 percent was over age 62. The population in the two housing projects had unusually high concentrations of people under age 18. The areas experiencing renovation had significantly lower concentrations of people under age 18 and over age 62 (12 percent and 6 percent, respectively).

The 1980 average rent in the project area was $191, a 105 percent increase over 1970. The 1980 vacancy rate of 17 percent represented a 42 percent increase over the 1970 rate. The 1980 vacancy rate at the Cathedral Square Housing Project, located between East Brookline and Malden Streets, was 38 percent; while the Castle Square Housing Development, located between Herald and East Berkeley Streets, had only a 2 percent vacancy rate in 1980.

The area south of East Concord Street is the only area with a significant number of owner-occupied homes, many of which have been renovated recently. Between 1970 and 1980, the average value of owner-occupied homes in this area increased from $14,700 to $61,300, an increase of 317 percent.

The residential neighborhoods of the South End do not share a cohesive district-wide civic structure or identity. Organized by geographically distinct neighborhood areas and block associations, there is relatively little social interaction between areas. Individual neighborhoods tend to have independent positions on issues, such as gentrification (the renovation of residential structures by persons of higher income than those already living in the area), which affect the South End as a whole. Presently, there are nine active neighborhood associations and a dozen block associations and tenant councils. Each one tends to be relatively homogeneous in the ethnic and economic characteristics of its members.

Community Facilities

The South End project area contains very few community facilities; most of the facilities serving this area are located west of Washington Street.

The major community facilities located within the project area are identified on Table 6 and Figure 15.

3.3.2 South Boston

General Characteristics

South Boston's residential community encompasses the area stretching from Dorchester Avenue on the west to the Harbor on the east and south. Its southern section is divided into six distinct neighborhoods: City Point, Telegraph Hill, Columbus Park, Andrew Square, West Broadway, and D Street; the project study area includes parts of the last three neighborhoods.

South Boston is a middle income neighborhood with residents of Irish descent making up 46 percent of the population. The area has long been a cohesive community. According to a 1980 BRA Survey, 93 percent of the residents have been raised as Catholics and only 2 percent of the population is non-white. The 1980 South Boston population of 30,372 was 25 percent less than the 1970 population. The proportion of the population under age 18 decreased by 26 percent and the proportion over age 62 increased by 25 percent between 1970 and 1980. The proportion of the 1980 population made up of these two age groups was 23 percent and 20 percent, respectively.

The number of housing units declined by only one percent during the period between 1970 and 1980. Rental units made up a consistent 74 percent of the total units during this period, while the vacancy rate rose to 9 percent. Home values rose 121 percent while rents rose only 68 percent between 1970 and 1980. In 1980, the average home value was

Figure 15
Community Facilities – 2

0 350 700 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

Legend
— Neighborhood Boundaries
1 Community Facilities Identified in Text

25,328 and the average monthly rent as $129.

roject Study Area

The portion of South Boston ithin the project area is roughly the rea lying between G Street and the entral Artery/Southeast Expressway, rom Southampton Street to Summer treet.

The South Boston project area xperienced a much greater population ecline between 1970 and 1980 than ither South Boston as a whole or the ity of Boston; the project area opulation dropped by 39 percent, ompared to 18.6 percent for all of outh Boston and 13 percent for oston. This high rate of decline can e attributed partially to the D Street housing project where a number of units became vacant. The project area's proximity to the South Boston and South Bay industrial areas, which has resulted in intrusions of truck traffic on local streets, has not made it an attractive location for renovation.

The percentage of the population under age 18 decreased by 35 percent between 1970 and 1980. Residents over 62 years of age compose an increasingly large share of the community; between 1970 and 1980, the proportion of residents over age 62 increased by 15 percent. This suggests a loss of young families from the area.

The vacancy rate in the project area quadrupled between 1970 and 1980. Rents increased by 42 percent, a slower rate than that for the city as a whole (rents in Boston increased by 66 percent). The proportion of the total housing stock made up of rental units increased only slightly during this same period. The average value of owner-occupied homes increased 157 percent, compared to Boston's 83 percent increase, but on average, homes in the study area were still worth only 46 percent of the average value of homes in Boston during 1980.

The future of the South Boston project area will continue to be influenced to a great degree by the D Street housing project. Efforts by the Boston Housing Authority (BHA) are under way to rehabilitate the housing project and return it to full occupancy over the next five years. Probably second in importance to the influence of the D Street housing project is the effect of industrial land uses and through traffic on residential property values in the area.

Community Facilities

The facilities in the project area are identified in Table 6 and in Figure 14.

3.3.3 Chinatown/South Cove

General Characteristics

Approximately 5,000 Asian-Americans reside in the district, making it the fourth largest Chinatown in the country. The continuous influx of Asian immigrants and the expansion of commercial and institutional land uses have placed severe pressure on the limited housing resources of the area. The unique character of the Chinatown/South Cove area adds to Boston's diversity, and is a significant downtown tourist attraction.

Chinatown/South Cove is a fairly homogeneous neighborhood of low to middle-income Chinese. In the 1960s the area experienced a drastic decline in population due to a reduction of housing as a result of highway, institutional and urban renewal relocation and demolition. Recent relaxation of restrictions on Asian immigration has resulted in a substantial increase in immigrants from Taiwan, Hong Kong and Southeast Asia. Most of the housing in the area is overcrowded, and a large proportion of the buildings are dilapidated.

Although most immigrants live in families or are young single people, the community has between four

and five times as many households with elderly residents as the city as a whole. Median family income is considerably below that of the city as a whole: in 1970 it was $5100, compared to the citywide median of $9133. This may be partially accounted for by the high concentration of Chinatown/South Cove males in low-paying restaurant activities (77.3 percent) and women working as stitchers in the garment industry (72.9 percent). Some residents are well educated and highly skilled, but are underemployed due to the language barrier. It is estimated that 60 to 80 percent of the Chinese population in this district does not speak English.

The Chinatown/South Cove project area encompasses the entire Chinatown/South Cove neighborhood as delineated previously.

Community Facilities

Major community facilities in the area are listed in Table 6 and shown on Figure 14.

3.3.4 Waterfront

General Characteristics

The Waterfront has been a residential community since urban renewal projects began in the late 1960s. The Waterfront housing stock consists of newly constructed apartments and condominiums and older warehouse buildings that have been rehabilitated for residential use.

The population of the Waterfront area increased dramatically during the period of redevelopment; from 280 in 1970 to 2,876 in 1980, an increase of 927 percent. This is in contrast to a population decline of 13 percent citywide during the same period. The average size of Waterfront households is quite small; according to a 1973 survey by the BRA, 40 percent of households in the Waterfront contain one person, and 48 percent contain two people. This 1973 survey also indicated that Waterfront households tend to have high incomes, and 68 percent of the population were employed in professional or technical occupations.

Only 5 percent of Waterfront residents are under age 18, while this age group comprises 22 percent of the Boston population. The Waterfront's elderly population increased from 4 percent in 1970 to 13 percent in 1980. This increase is attributed to the development of two elderly housing projects which are primarily occupied by residents from the North End. Residents over age 62 represented a constant 15 percent of the Boston population during this period.

In keeping with the area's recent population growth, the number of housing units in the Waterfront increased by 981 percent, from 141 in 1970 to 1,524 in 1980. The proportion of rental units dropped from 99 percent in 1970 to 79 percent in 1980. Owner-occupied units are condominiums. The vacancy rate dropped from 11 to 6 percent, compared to an increase from 6 to 9 percent in the city as a whole. Monthly rents increased from $299 (1970) to $697 (1980). This contrasts sharply with the 1980 Boston average of $191 per month.

The period of rapid population and housing growth is ending as Waterfront development nears completion.

Community Facilities

There are no schools, churches or public service facilities in the Waterfront area, reflecting the population composition and newness of residential use in this area. There are several parks, including Christopher Columbus Park, Dock Square and Curley Memorial Plaza. The Faneuil Hall Market Place and the New England Aquarium are important tourist attractions in the Waterfront. The MBTA Blue Line Aquarium Station serves this area, and Waterfront residents are also served by the nearby MBTA Haymarket Station (Orange and Green

Lies). Community facilities are
listed in Table 6 and shown on Figure
1.

3.3.5 Government Center

General Characteristics

Government Center is not a residential neighborhood, and has limited community facilities which serve local residents. Government Center does have a significant number of federal, state and municipal offices and services, and the areas served by these facilities range from specific sections of Boston to all of Massachusetts or New England.

Community Facilities

Governmental offices are located in various buildings, including Boston City Hall, the John F. Kennedy Federal Building, and the Massachusetts Departments of Social Services, Public Welfare and Employment Security. Social and health services are also located in the Veteran's Administration Outpatient Clinic, Jewish Social Services Building and the Lindemann Mental Health Center. The Boston Police Station, District A, serves Downtown Boston, East Boston and Charlestown. The Cardinal Cushing Memorial Park, and City Hall Plaza are also found in this area (see Figure 15 and Table 6).

Because this area serves as a regional service center, access is of great importance. Due to the lack of inexpensive parking, the majority of visitors to the area use public transit. The Government Center MBTA Station, centrally located in City Hall Plaza, is served by both the Green and Blue Lines. Bowdoin Station, near Cardinal Cushing Memorial Park, is the terminus of the Blue Line. Haymarket Station is served by the Orange and Green Lines, and is also the terminus for nine bus lines connecting Government Center with various communities in the Boston Metropolitan area, and the northern and western suburbs.

3.3.6 North End

General Characteristics

The North End is an historic neighborhood dating to pre-Revolutionary War days. Although largely Italian and Catholic at the present time, the North End previously housed other immigrant groups.

The population of the North End declined by 22 percent between 1970 and 1980, as compared to a 13 percent decline citywide during this same period. The North End population under age 18 decreased by 48 percent from 1970 to 1980, as compared to a 21 percent decrease citywide. The proportion of the North End population over age 62 fell slightly between 1970 and 1980 (from 17 percent to 15 percent), while the senior citizen population of Boston remained constant at 15 percent. There is only one elderly housing complex located in the North End.

Census figures show an increase between 1970 and 1980 in both the number of dwelling units in the North End and in housing costs. The number of units increased by 11 percent, 4 percent more than the citywide average, while the proportion of rental units declined by 1 percent.

The increase in the total number of housing units is due to relatively new housing such as Casa Maria Elderly Housing (84 units), the conversion of the McLaughlin Elevator Factory into 28 dwelling units, and the subdivision of some larger units into smaller ones. A slight decrease in rental units is the result of condominium conversions, primarily in areas adjacent to the Waterfront.

Average North End rents increased from $72 in 1970 to $184 in 1980. This is a 166 percent increase, compared to a 66 percent citywide increase during this same period. The average value of owner-occupied homes increased by 263 percent; citywide, owner-occupied housing values increased by 83 percent.

The North End is perceived as a desirable place to live, and the demand for housing has increased, especially among people aged 20-34. The market continues to respond to this demand: 58 units of luxury housing are planned on Commercial Street; over 70 rental units are being developed in an abandoned factory building on the corner of Thatcher and North Margin Streets; and smaller complexes of luxury housing are under construction or for sale on smaller North End lots.

Recent census material suggests that new groups of people are moving to the North End, resulting in the escalation of housing costs beyond the reach of many North End residents. Economic pressures are one reason for the outmigration of Italian residents from the North End.

Community Facilities

Despite ongoing changes, the North End endures as a cohesive ethnic community. Community facilities and services geared specifically to the Italian community are in part responsible for helping to maintain the strong sense of community in the North End.

Many of the facilities are located in the central section of the North End (see Figure 15). Those serving the general population are the fire department, branch library, post office and the North End Community Health Center (which has several programs geared specifically to the large elderly population). The North End also has several facilities, such as the North End Union, the Michael Nazarro Recreation Center, the North End Neighborhood Services Center, and the North Bennet Union, which serve special segments of the population including the young and elderly.

The North End is a largely Roman Catholic community supporting four Catholic churches. The two largest churches, Sacred Heart and St. Leonard's, offer Masses in both Italian and English. Churches directly or indirectly sponsor several social activities for community residents. The Old North Church is Episcopalian and draws a small congregation from the North End and suburban Boston, and serves tourists and other visitors to Boston.

There are both public and private schools in the North End. The North End is part of Boston's School District 7, which includes the West End, South End and Lower Roxbury. The neighborhood contains two public schools and two parochial schools.

The area has many parks, playgrounds and other recreation facilities, including a tennis court, a skating rink and a sports complex.

There are no MBTA stations in the North End; the Haymarket, North Station and Aquarium Stations are located within walking distance. One MBTA bus line connecting Haymarket and the Army Base in South Boston stops in the North End.

While there is no large supermarket in the North End, many small stores provide Italian specialty items, bread, cheese, meats, fruits and vegetables. A senior shuttle to the Stop and Shop on Cambridge Street in the West End is available; other residents use cars to shop in supermarkets outside the neighborhood.

3.3.7 North Station

General Characteristics

Like Government Center, North Station is not a residential community, and there are no schools, churches, fire or police stations or service facilities in the North Station area. There are concentrations of commerce, manufacturing and entertainment facilities, and, as the terminus of the MBTA's north side commuter rail lines, North Station is a major transportation node for Boston. The North Station MBTA transit stop is served by the Green and Orange Lines. Access to these facilities is of prime

portance.

The major pedestrian connection tween downtown and the North Station ea is Canal Street, which has cently been improved with widened dewalks and street trees. Other destrian access to North Station is a Staniford and Causeway Streets.

ommunity Facilities

Regional facilities, including dministrative offices of the assachusetts Department of Mental ealth and Children's Services, the paulding Rehabilitation Hospital, the assachusetts Registry of Motor ehicles, and the Boston Garden, are ocated in this area (see Figure 15 nd Table 6).

Future community facilities are lanned as part of the redevelopment ccurring in this area. An MDC linear ark along the Charles River onnecting the Esplanade, new Charles iver Dam and Charlestown, and a useum or other public building, are art of these redevelopment plans. lso, as indicated previously, the BTA Green Line facility at North tation will be relocated.

.3.8 West End

eneral Characteristics

The population of the West End onsists almost entirely of the esidents of Charles River Park. andscaping, site design and the bsence of through streets within the evelopment all serve to isolate esidents from the surrounding area. esidents of Charles River Park are enerally in middle- to upper-income rackets. Households tend to be small. Many residents are Massachusetts General Hospital employees who are in the area for short-term positions.

Between 1970 and 1980, when several of the Charles River Park buildings were completed, the West End population rose from 2,500 to 4,014, an increase of 61 percent. The proportion of the population under 18 years of age remained at 6 percent during this period. As previously indicated, in the City of Boston the total population decreased by 13 percent during this same period, while the proportion of the population under age 18 decreased slightly from 28 percent to 22 percent. The proportion of the West End population over age 62 increased slightly from 14 percent to 15 percent during this period, compared to a constant 15 percent citywide.

The total number of housing units in the West End rose from 1,485 in 1970 to 2,457 in 1980, an increase of 65 percent. Rental units comprised over 99 percent of the housing stock of the West End in 1980, as compared to 73 percent in Boston. Vacancies in the West End decreased sharply between 1970 and 1980, from 11 to 1 percent; by contrast, Boston's vacancy rate increased from 6 to 9 percent during this period. Average monthly rents have remained higher in the West End than in Boston as a whole; the average monthly rent was $259 in 1970 in the West End, and rose by 68 percent to $438 in 1980. Boston's average monthly rent was $115 in 1970 and increased to $191 in 1980.

Community Facilities

Community facilities serving West End residents include two churches, a synagogue and a branch library. Massachusetts General Hospital, the Massachusetts Eye and Ear Infirmary and the Shriners Burns Institute serve a regional and national clientele and bring a large number of visitors to the neighborhood (see Figure 15 and Table 6). The Charles Street Jail is a county-wide facility.

3.3.9 East Boston

General Characteristics

East Boston's residential population is a fairly homogeneous group with strong Catholic and Italian identities. According to a BRA

survey, 57 percent of the neighborhood's population is of Italian origin; the next largest ethnic group is of Irish descent, with 17 percent of the population.

The East Boston project area is roughly the area lying south of Curtis Street and bounded by Logan Airport and Boston Harbor.

In the East Boston project area, population decreased by 16 percent between 1970 and 1980; in some subareas, the population decreased by as much as 25 percent (Boston's population decreased 13 percent).

From 1970 to 1980 the percentage of the total population under age 18 decreased by 26 percent, and the percentage of the population over age 62 rose by 36 percent. The high average age of study area residents reflects the area's large elderly population. The actual number of elderly residents increased by 15 percent, even though the total population declined. Although decreasing, the area has a slightly larger proportion of children than Boston as a whole. The proportions of the 1980 population under age 18 and over age 62 were 23 percent and 19 percent, respectively, for the East Boston project area and Boston as a whole.

Between 1970 and 1980, the number of housing units in the study area increased by 13 percent, while the vacancy rate increased from 8 percent to 12 percent. In some areas the vacancy rate went as high at 16 percent. Rents increased by 90 percent during this period, and the average value of owner-occupied homes increased by 116 percent. The rates in Boston were 66 percent and 83 percent, respectively. In 1980, rents and home values in the project area were still only about two-thirds as high as in Boston as a whole. The average 1980 value of an owner-occupied home was $24,176 (the Boston average was $36,000). The average 1980 rent was $122.

The project area in East Boston is a relatively stable community. A large percentage of the population was born in the community and has lived there ever since. The changes shown in the census and BRA statistics for the East Boston project area are broadly similar to those which occurred in Boston as a whole: the population decline is to a great extent the result of the natural aging process in the area's families and the outmigration of young people beginning families. However, this part of East Boston has an increasingly larger older population, while the older population of the city as a whole is remaining stable. This suggests that in the next two decades there will be a relatively high potential for neighborhood change. This potential might lead either to increased housing vacancies or to some form of gentrification which might provide housing opportunities for the area's young people to set up their own households. The outcome will probably be influenced both by East Boston's amenities and by its environmental characteristics such as noise and air pollution, which vary significantly among East Boston neighborhoods.

Community Facilities

The service areas of the community facilities encompass several East Boston neighborhoods. The residential areas on each side of the Conrail railroad right-of-way are considered to be distinct neighborhoods by most residents--Central/Maverick to the west, Mt. Carmel and Jeffries Point to the east--but almost every community facility on either side of the railroad right-of-way is used by residents of both sides. This is true of schools, churches, social service agencies, recreational facilities, retail areas and places of employment.

The major community facilities in the East Boston project area are identified in Table 6 and in Figure 14.

As a predominantly Roman Catholic community, East Boston's

rish churches are both gathering ints for community activities and lineators of different ighborhoods. There are 10 public hools in East Boston and 3 parochial hools. The majority of East ston's public facilities and social rvice providers are located in the ntral/Maverick area.

A number of facilities serving e general population of East Boston e in this area, including the police d fire stations, the post office, e branch library, and the MBTA ations.

.4 ECONOMIC ACTIVITY

.4.1 Overview

Terms used in the economic onditions and economic impact ections are defined, unless otherwise oted, as follows: Region: The reater Boston Standard Metropolitan tatistical Area (SMSA), roughly all conomic activities within Interstate oute 495; City: City of Boston; roject or Study Area: all project ubareas, encompassing zip codes 2108, 02109, 02110, 02111, 02113, 2114, 02118, 02128 and 02210 roughly, the Boston Central Business istrict (CBD), plus the northern outh Boston industrial district and ast Boston).

Economic subareas are based on ip codes, the geographic unit for hich employment statistics were vailable from the U.S. Census of ounty Business Patterns (See Figure 6). The subareas include the Eastern etail Core (02108), Northern aterfront/Faneuil Hall (02109), inancial District/Waterfront (02110), hinatown/Leather District (02111), orth End (02113), Government enter/West End/North Station (02114), he South End (02118), East Boston (02128) and the northern, industrial section of South Boston (02210). Economic sectors are defined by Standard Industrial Classification (SIC) codes, including agriculture/fishing; construction; manufacturing; transportation, communications, and utilities (TCU); wholesale trade; retail trade; financial, insurance, and real estate (FIRE); services; and government.

The economic study area is New England's financial capital, the seat of state, city, and county government, a regional center of service industries, a significant manufacturing and wholesale base for the city, and a retail magnet. Total employment in the study area in 1980 was approximately 237,000 workers, approximately 17 percent of total employment in the Greater Boston SMSA. Government offices in the downtown area employed an estimated 50,400 workers in the government sector in 1981. This is almost 60 percent of all government employment in the City of Boston and 25 percent of all government employment in the SMSA. (East Boston and South End government employment has not been enumerated, and thus is not included. However, their shares of government employment are not likely to be significant.)

The FIRE (Financial, Insurance and Real Estate), selected services, and government sectors are the dominant employers within the study area. Together, these three sectors account for nearly 160,000 jobs; approximately 67.5 percent of total study area employment.

Over a third (37.6 percent) of overall SMSA employment in the FIRE sector is concentrated within the CBD study area. In addition, the study area holds approximately 46 percent of Boston's manufacturing jobs, 49 percent of the City's wholesale employment, and 34.6 percent of citywide jobs in the retail sector.

Regional Access to Logan Airport

Within the past ten years, Logan Airport's importance to the regional economy has increased significantly. Over this period, the value of air freight movements for international export from the Boston Customs Region grew by 838 percent, to $245.5 million in 1982. Air freight

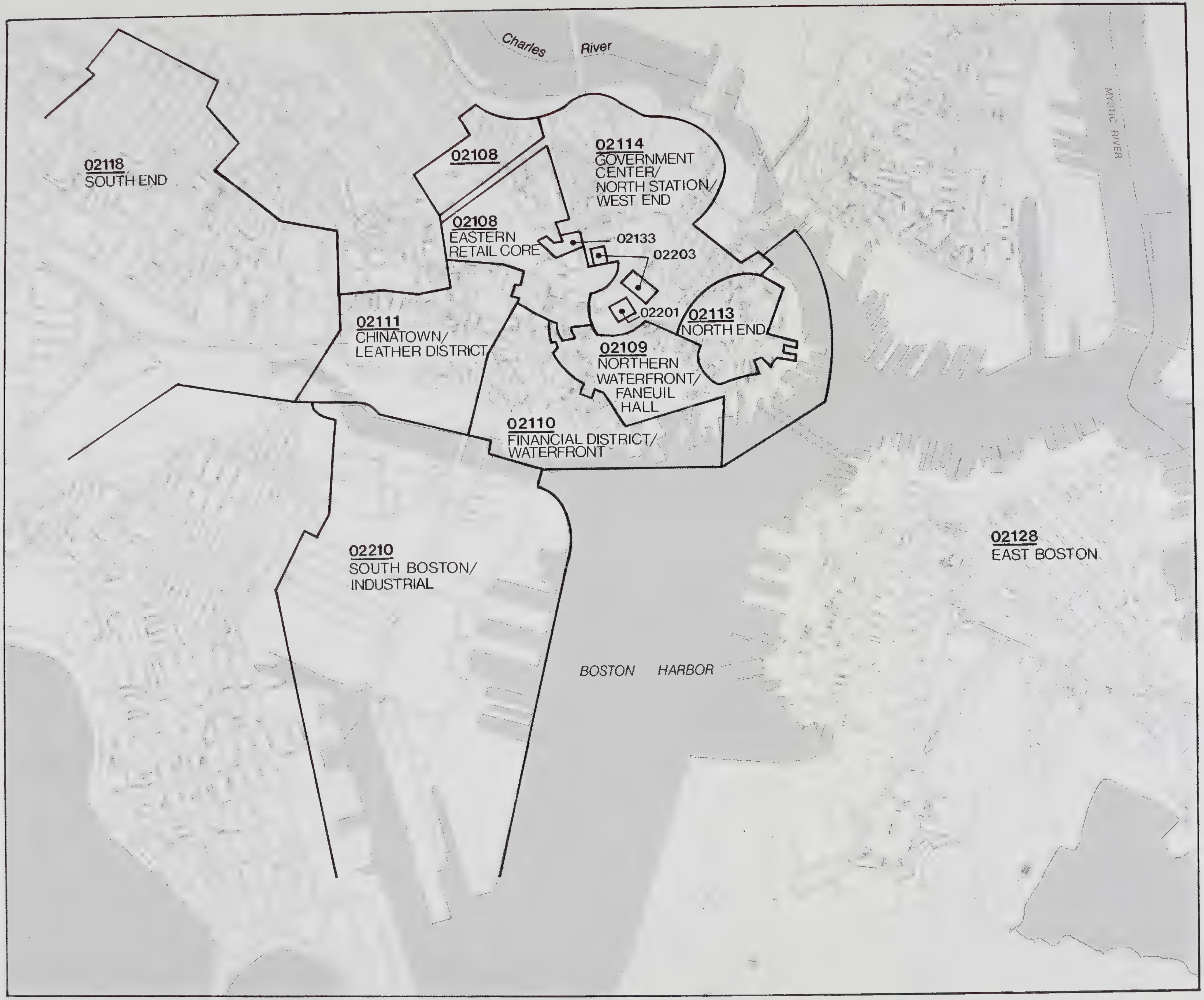


Figure 16
Zip Code Districts Used for Economic Inventory

EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Ar

Zip codes 02133, 02203, 02201, although shown on map, were omitted from analysis because the Census Bureau does not enumerate government employment.

Source: Boston Redevelopment Authority

movements in 1982 accounted for 54 percent of the value of all international export shipments from the Boston Customs Region, up from 30 percent in 1972. (Source: U.S. Department of Commerce; Highlights of U.S. Export and Import Trade, FT 990/December 1972 and 1982.)

Similarly, air freight movements are significant to many of the region's manufactured products destined for distant domestic markets. Two industry groups in particular, machinery and electric machinery and equipment are especially dependent on time-sensitive access to Logan. These two industry groups (which comprise most of computer production and related firms), account for an estimated 51 percent of the value of domestic air freight movements from the Boston Production Area. (Source: Department of Commerce, Census of Transportation, "Commodity Transportation Survey," 1972, 1977.) These two industry groups now account for one-third of regional and statewide manufacturing employment. Virtually all of these industries' domestic air freight outgoing shipments require same day or next day service.

Neither shipping value nor weight statistics fully portray the significance of time-sensitive air freight shipments to the high technology industries, because they understate the importance of service commitments and critical components delivery to overall business operations. Other regional manufacturing industries that are particularly dependent on time-sensitive access to Logan include fisheries, paper, and scientific instruments. Of the total cargo-carrying flight arrivals and departures at Logan, 27 to 29 percent occur during AM and PM peak hours (Source: Massport).

Study Area Employment by Sector

Table 7 presents a summary of employment within the study area by sector.

The study area's FIRE sector employed 39,975 people in 1,266 establishments in 1980, representing 69.6 percent and 37.6 percent of total financial sector employees in the city and SMSA, respectively. Citywide employment in this sector is expected to increase 22 percent between 1980 and 1990, according to recent BRA estimates.

With 69,574 workers in the study area in 1980, the selected service sector employed 29.4 percent of total study area workers. This sector contains the largest number of employees in the study area. Except in the North End and South Boston (industrial) subareas, this is also the most prominent sector in terms of establishments. Although not as centralized as the FIRE sector, the selected service sector in the study area captures 46.1 percent of the city's and 17.5 percent of the SMSA's total service sector employment.

Manufacturing, which is concentrated in the South Boston (north) and Chinatown/Leather District subareas generates 10.3 percent of the study area's employment (24,517 jobs). Although not as dominant an employer as the service or financial sectors, manufacturing employment in the study area constitutes 45.9 percent of all manufacturing jobs in the city, and 52.7 percent of the city's manufacturing establishments. On a regional level, manufacturing in the study area accounts for 8.3 percent of SMSA manufacturing employment. Citywide, manufacturing has declined by a small percentage since 1975, and is not expected to increase during the 1980s.

Transportation, communication and public utilities employ only a small share of the study area's workers (7.2 percent), but the study area contains 48.9 percent of the city's employees in these sectors and 24 percent of the SMSA's TCU employees. These sectors are most dominant in East Boston, where they constitute 38.8 percent of East Boston's employment, and are

Table 7

STUDY AREA EMPLOYMENT BY SECTOR

Sector	Number of Employees in Study Area	Percent of Total
Selected Services	69,574	29.4
Government*	50,400	21.3
Finance, Insurance and Real Estate	39,975	16.9
Manufacturing	24,517	10.3
Retail	18,168	7.7
Transportation, Communication and Utilities	16,945	7.2
Wholesale Trade	11,491	4.8
Non-classifiable	3,488	1.5
Construction	2,106	0.8
Agricultural, Forestry, Fishing and Mining	226	0.0
	236,890	99.9

*Does not include government employment in the South End and East Boston, however, their shares of government employment are not significant.

nerally dispersed throughout the st of the study area, ranging from 2 11 percent of total employment in e other subareas.

Retail trade provides 7.7 rcent of total study area ployment, with 18,168 workers in 33 establishments. With both neuil Hall Market Place and the wntown Crossing, the study area ntains the foremost retail center in e city, with 34.6 percent of the ty's retail employment. Almost 7.6 rcent of the SMSA's retail employees rk in the study area, a fairly large are for such a dispersed sector. e study area contains the largest ncentration of comparison shopping tail stores in the region (an timated $373 million sales in 1982).

Central Business District (CBD) tail sales in real terms had clined steadily for 30 years until 77. Since that time, sales have abilized due to the addition of the aneuil Hall Market Place and the rowth in downtown office employment. 3D retail sales and employment are xpected to increase over the next ecade with the addition of Lafayette lace and the continued growth in ffice employment.

The study area contains an even arger share of the wholesale sector ith 49.1 percent of the city's and 4.3 percent of the region's wholesale ector employees working in the study rea. The area's importance in holesale trade is in part due to its ccess to surface, rail and water ransportation facilities. Within the tudy area, the wholesale sector mploys 4.8 percent of the ork-force. Boston's employment in his sector has remained static since 975, but this sector is expected to row by 12 percent in Boston during he 1980s, according to recent BRA stimates.

The agriculture, forestry, ishing and mining sectors are not significant on a regional scale, with nly 4.5 percent of the SMSA's employment in these sectors in 1980. These sectors account for less than one percent of the total study area employment (226 workers). However, what little employment there is in these sectors in the city is highly concentrated in the study area; almost all of the city's employment in these categories, primarily fishing, occurs in the study area.

Construction is also a relatively small sector in the overall study area, employing 0.8 percent of the study area's labor force (2,106 employees) in 1980. Of Boston's construction industry employees, 18.5 percent work in the study area, and 4.9 percent of the SMSA's construction employment is in the study area.

According to BRA estimates made in 1983, almost all sectors are projected to grow between 1980 and 1990 in the City of Boston. Of the 83,020 net new jobs projected for the decade, 62 percent are expected to be in the selected services sector, and 18 percent in the FIRE sector.

3.4.2 Economic Activities by Subarea

Non-government employment in the subareas is summarized by sector in Table 8; subareas are identified in Figure 16. Government employment is not available at the subarea level of detail.

Eastern Retail Core (02108)

Total non-government employment in this subarea numbered 32,739 in 1980. The subarea contains a relatively high percentage of the city's employment in the selected services and FIRE sectors. Specifically, the Eastern Retail Core subarea contains 14.1 percent of the total FIRE sector employment in the city and 11.5 percent of the city's selected services employment.

Although the FIRE, selected services, and retail sectors are expected to grow in downtown Boston, the majority of this new growth will occur in other subareas where there is more available land for development.

Table 8

NUMBER OF ESTABLISHMENTS AND EMPLOYEES
BY TYPE OF BUSINESS WITHIN THE AFFECTED ZIP CODES *
(1980)

Zip Code:	Eastern Retail Core (02108)		Northern Waterfront/ Faneuil Hall (02109)		Financial District/ Waterfront (02110)		Chinatown/ Leather District (02111)		East Boston (02128)	
Type of Business	Establishments	Employees	Establishments	Employees	Establishments	Employees	Establishments	Employees	Establishments	Employees
Agriculture, Forestry Fishing & Mining	4	187	2	10	3	10	0	0	0	0
Construction	23	691	11	293	15	159	7	86	33	420
Manufacturing	33	1,226	14	67	90	2,991	135	6,012	47	3,096
Transportation, Communication & Public Utilities	29	622	50	1,397	54	4,512	7	410	86	7,572
Wholesale Trade	85	615	47	627	103	1,419	171	1,564	30	492
Retail Trade	232	3,475	196	3,216	136	2,495	181	1,715	153	3,098
Finance, Insurance & Real Estate	243	8,076	460	12,769	367	13,712	43	787	20	192
Services	761	17,387	631	11,834	462	10,909	191	7,935	127	4,593
Nonclassifiable Establishments	74	460	71	314	43	2,369	22	76	18	59
TOTAL	1,484	32,739	1,482	30,527	1,273	38,576	757	18,585	514	19,522

Zip Code:	North End (02113)		Government Center/ West End/N. Beacon Hill/North Station (02114)		South Boston (North) (02210)		South End (02118)		Total	
Type of Business	Establishments	Employees	Establishments	Employees	Establishments	Employees	Establishments	Employees	Establishments	Employees
Agriculture, Forestry Fishing & Mining	0	0	0	0	0	0	3	19	12	226
Construction	7	30	15	116	9	239	10	72	130	2,106
Manufacturing	11	365	41	2,016	111	6,045	54	2,699	536	24,517
Transportation, Communication & Public Utilities	9	60	12	1,298	19	486	19	588	205	16,945
Wholesale Trade	9	69	43	888	138	3,089	122	2,728	748	11,491
Retail Trade	84	603	132	1,786	36	1,123	83	657	1,233	18,168
Finance, Insurance & Real Estate	6	61	70	2,067	32	2,151	25	160	1,266	39,975
Services	25	221	257	10,534	59	1,226	127	4,935	2,640	69,574
Nonclassifiable Establishments	3	8	22	60	6	15	18	127	277	3,488

ure development in this area will limited mainly to renovations of sting buildings.

thern Waterfront/Faneuil Hall 109)

Total non-government employment this subarea was 30,527 in 1980.

The majority of the non-'ernment employment (80.6 percent) the Northern Waterfront/Faneuil .l subarea is in two sectors: FIRE l selected services. Retail ployment in this subarea is not ninant, but does represent 22 rcent of all retail employment in study area. Faneuil Hall Market ace is the center of retail ivity. This 220,000 square foot nter generated an estimated 7 million in retail sales in 1982. 1977 survey showed that 51 percent all Faneuil Hall Market Place oppers arrived by auto rather than ing the available public transit stem, with only 24 percent City of ston residents.

Growth in this subarea will kely occur mainly in the FIRE and lected services sectors. Develop-nt in the Waterfront should remain able, with the exception of housing velopment, mentioned in Section 3.2 ND USE.

nancial District/Waterfront (02110)

Total non-government employment the Financial District/Waterfront barea was 38,576 in 1980. The jority of the employment was in FIRE d selected services. Retail tivities in this subarea include rt of Downtown Crossing, and retail ployment represents 17 percent of l retail employment in the study ea.

The Financial District/ terfront is currently the most tive development location in wntown Boston. Major new office velopments and proposals for the ea, discussed previously in Section 2 LAND USE, and renovation and rehabilitation of existing buildings for office use, are likely to encourage growth in the selected services and financial sector employment.

Chinatown/Leather District (02111)

In addition to Chinatown and the Leather District, this subarea includes part of the retail core, the adult entertainment district (Boston's Combat Zone), and the retail/office zone to the south of Summer Street. Non-government employment in this subarea totals 18,585; with 75 percent of this employment in the selected services and the manufacturing sectors. Manufacturing employment in this subarea is dominated by the apparel (2,676 employees) and instruments (2,188 employees) industries, and accounts for 32 percent of manufacturing employment in the study area. Retailing in the area is dominated by the Jordan Marsh department store and smaller general merchandise, apparel, and food stores along lower Washington Street.

North End (02113)

The North End has very little employment (1,417 jobs). Forty-three percent of non-government employment in this area is in retail trade, and 72 percent of this retail employment is estimated to be in food markets and eating and drinking establishments. The 365 manufacturing jobs in the area are concentrated in the apparel and accessories industry (86 percent).

Government Center/West End/No. Beacon Hill/North Station (02114)

Non-government employment in this subarea totals 18,765. Of this employment, 56 percent is in the selected services sector, and the majority of the remaining employment is distributed in retail, FIRE, TCU, and manufacturing sectors. This subarea contains the major concentration of total study area government employment.

South End (02118)

Businesses in the South End area employed 11,985 non-government workers in 1980, primarily in the service, wholesale and manufacturing sectors. The largest sector is services, providing 41.2 percent of the employment in the subarea. With Boston City Hospital and University Hospital located in the South End, health services account for most of the employment in the services sector.

The wholesale sector provides 22.8 percent of all non-government employment in the South End. The South End houses the second largest wholesale sector in the study area, following South Boston. Almost one-quarter of all wholesale employees in the study area work in the South End.

Manufacturing is nearly as large as wholesaling, employing 22.5 percent of South End non-government workers. Industrial uses include high tech manufacturing or research (Teradyne and New England Nuclear are the largest), and printing.

East Boston (02128)

East Boston, including Logan Airport, contains 514 business establishments employing 19,519 people, approximately 5 percent of total city non-government employment.

Nearly 40 percent (7,572 employees) of the jobs in East Boston non-government employment are in the TCU sector. Clearly dominating employment in this sector is the air transportation industry, containing an estimated 6,369 employees and representing roughly 97 percent of city employment in this sector. Logan Airport is undoubtedly the source for most of the transportation employment in East Boston.

Another 24 percent (4,593 employees) of East Boston non-government employment falls in the selected services sector, with business services being the dominant industry. The retail and manufacturing sectors each hold roughly 16 percent of total non-government employment in East Boston. This compares with the wholesale trade, construction and FIRE sectors, each of which contain less than 500 employees.

Employment growth in East Boston over the next several years will likely be limited largely to airport related and/or dependent activities.

The future of the Airport as a center of economic activity is likely to involve substantial growth in air cargo over the next 20 years. This is due to reliance on air travel and shipping by sectors of the regional economy such as computing equipment, instruments, and bio-medical products.

South Boston (02210)

Total non-government employment in the South Boston (north) subarea numbers 14,374. Sixty-three percent of this employment is in the manufacturing and wholesale sectors. In the manufacturing sector 44.7 percent of the employment is in the printing and publishing industry, followed by 14.7 percent in food products and 13.7 percent in apparel and accessories.

In the future, employment in manufacturing and wholesaling is expected to increase in the South Boston Army Base and the Boston Marine Industrial Park.

3.5 EXISTING AIR QUALITY

3.5.1 Regional

Five pollutants are routinely monitored by the Massachusetts Department of Environmental Quality Engineering (DEQE), Division of Air Quality Control. Based on consultations with DEQE and the U.S. Environmental Protection Agency (EPA), however, it was determined that three

Table 9

FEDERAL AND MASSACHUSETTS AIR QUALITY STANDARDS

Pollutant	Averaging Time[a]	Primary Standards[b]	Secondary Standards[b]
Carbon Monoxide	one-hour	40 mg/m^3 (35 ppm)	Same as primary
	eight-hour	10 mg/m^3 (9 ppm)	Same as primary
Nitrogen Dioxide	Annual[c]	100 ug/m^3 (0.05 ppm)	Same as primary
	one-hour[d,e]	470-940 ug/m^3 (0.25-0.50 ppm)	Not proposed as yet
		320 ug/m^3 (0.17 ppm)	
Ozone	one-hour	240 ug/m^3 (0.12 ppm)	Same as primary

a. Except for the annual standards, all standards are specified as not to be exceeded more than once a year.

b. Standards are given in micrograms per cubic meter (ug/m^3), milligrams per cubic meter (mg/m^3), and in parts per million (ppm).

c. Arithmetic mean.

d. Proposed EPA standard.

e. The Commonwealth of Massachusetts' DEQE has imposed a maximum one-hour policy level of 320 ug/m^3.

Table 10

MEASURED EXISTING AIR QUALITY IN THE

METROPOLITAN BOSTON AREA IN 1980

OZONE:

Site Description	Comments	Max. One-hour	No. of Times > Std.*
E. Boston	On Bremen St.	0.120+	0
Medfield	N. Meadow St. SW of Boston	0.159	13
Medford	Rte. 16	0.079**	0
Somerville	Tufts University	0.140	5
E. Boston	Nr. Callahan	0.070**	0

NITROGEN DIOXIDE:

Site Description	Comments	Max. One-hour	No. of Times > Std.*	Arithmetic Mean
Boston	Kenmore Sq.	338++	-	93**
E. Boston	Callahan Tunnel	395	-	101**
Somerville	Tufts University	132	-	45**
E. Boston	On Bremen St.	197	-	61**

CARBON MONOXIDE:

Site Description	Comments	Max. One-hour	No. of Times > One hour Std.*	Max Eight-hour	No. of Times > Eight hour Std.*
Boston	Kenmore Sq.	16.1++	0	11.8	3
E. Boston	Callahan Tunnel	18.4	0	11.9	10
E. Boston	Bremen St.	9.2**	0	5.4**	0
Boston	Downtown, 600 Washington	28.8	0	13.9	2
Medford	Rte. 16	19.6	0	12.2	3
Somerville	Tufts University	6.9**	0	4.4**	0

*One-hour standard for ozone is 0.12 parts per million (ppm); proposed EPA one-hour NO_2 standard is 470 to 940 micrograms per cubic meter (ug/m^3), although DEQE policy level is 320 ug/m^3; annual NO_2 standard is 100 ug/m^3; and the one-hour and eight-hour CO standards are respectively 40 and 10 milligrams per cubic meter (mg/m^3).

++Concentrations for ozone are given in ppm; for NO_2, in ug/m^3; and for CO, in mg/m^3.

**Limited number of observations.

these, ozone, nitrogen dioxide ($_2$), and carbon monoxide (CO) ld be examined in this study for poses of defining the existing air lity in the Metropolitan Boston a.

Measured air quality levels are pared with applicable standards to ermine the quality of the air and potential for adverse health ects. Both the National Ambient Quality Standards and the ssachusetts standards for CO, NO_2, ozone are shown in Table 9. The ent of the primary standards is to otect the public health, while the ent of the secondary standards is protect the public welfare from any own or anticipated effects.

In 1980, DEQE operated nineteen ations statewide to measure ozone. xteen of these stations reported olations of the one-hour ozone andard. This demonstrates the rvasiveness of the problem of ozone this state. Table 10 shows the ximum one-hour ozone concentrations ported by a number of stations in e Metropolitan Boston area. ncentrations in excess of the andard were reported for sites in dfield and Somerville. Monitoring tes in Medford and in East Boston ar the Callahan Tunnel were scontinued in 1980 and their latively low readings of maximum e-hour ozone may be a reflection of e limited number of observations. e site on Bremen Street in East ston did not record any violation, though the maximum one-hour reading s equal to the standard level of .12 parts per million (ppm).

DEQE monitored NO_2 at six ations in 1980. Four of these ations were located in Metropolitan ston. The one-hour and annual mean ncentrations for the Metropolitan ea sites are also shown in Table). There is presently no short-term andard for NO_2. There is, wever, a proposed EPA one-hour andard in the range of 470 to 940 g/m^3. The Commonwealth has imposed stricter one-hour policy level of 320 ug/m^3. When measured against the State's policy level, the Kenmore Square and Callahan Tunnel sites had one-hour concentrations in violation of this policy. The state and federal annual standard for NO_2 is 100 ug/m^3. Although arithmetic means were reported, the limited amount of data collected in 1980 precludes a definitive assessment of violation of the annual standard at this time.

Thirteen CO monitoring stations were operated by DEQE in 1980. The maximum one-hour and eight-hour concentrations for the stations located in the Metropolitan Boston area are also presented in Table 10. No violation of the one-hour standard of 40 milligrams per cubic meter (mg/m^3) was reported anywhere; the highest one-hour concentration of 28.8 mg/m^3 was reported for a site at Washington Street in downtown Boston. Violations of the eight-hour standard of 10 mg/m^3 were reported at Kenmore Square, Callahan Tunnel, Washington Street, and Wellington Circle. Ten separate violations were recorded at the Callahan Tunnel site. The maximum eight-hour concentration at this site was 11.9 mg/m^3.

3.5.2 Local

To assist in defining the existing conditions for the purpose of assessing the impact of the proposed project, a two-month continuous monitoring of CO at one site on Kneeland Street was conducted. This continuous monitoring was supplemented by a series of short-term measurements at a number of selected intersections or traffic congested areas that are expected to be affected by the proposed project. These areas are:

- Leverett Circle
- North End/Callahan Tunnel
- Dewey Square/South Station
- Bell Circle in Revere

Another area in the vicinity of

the Sumner Tunnel portal in East Boston is known to have frequent high traffic congestion. This area was not selected for additional CO measurements, however, because there is sufficient historical data from a DEQE operated monitoring site in this area to characterize the existing air quality at this location.

The locations of the continuous monitor and the individual short-term measurement sites are shown in Figure 17.

Although the intent of the short-term monitoring program was to establish a reasonable level of CO for background concentration, and NCHRP 2000 criteria were met, the actual measurements yielded relatively low results. After consultation with DEQE and EPA, it was agreed that the 1-hour background of 4.4 ppm for 1980 - based on MDPW's North Area Project Study - be used in the modeling analysis. Then, applying techniques approved by DEQE including an 0.8 eight-hour persistence factor, the following CO background concentrations were used:

Year	One-Hour	Eight-Hour
1982	4.0 ppm	3.2 ppm
1990	2.1 ppm	1.7 ppm
2010	1.6 ppm	1.3 ppm

Because the resulting background concentrations used are higher than the results from monitoring, the air quality analysis overestimates the total CO concentrations and thus yields conservative results.

The methods and instrumentation used in the continuous monitoring of CO are approved by the EPA. Guidelines developed by the EPA were followed in both site selection and probe placement. Additionally, DEQE provided advice on the final selection of the monitoring sites and in the quality assurance and field audit of the instrumentation and measured results.

Table 11 shows the maximum one-hour and eight-hour CO concentrations measured by the continuous monitor at Kneeland Street for the period January 6 through March 29, 1982. The maximum recorded one-hour CO concentration at this site was 7 parts per million (ppm). This concentration is well under the corresponding standard of 35 ppm. The maximum eight-hour average CO concentration at this site was 4.4 ppm, which is also below the corresponding 9-ppm standard. No violation of either standard was recorded.

Table 11 also summarizes the results of the short-term measurements conducted at Leverett Circle, the North End, Dewey Square, and Bell Circle. The short-term measurements at each site were taken during an approximately 12-hour period on two separate days. No violations of the one-hour standard were found. The highest one-hour CO concentration of 13.6 ppm was measured at the Quincy Market garage site (CT1). The Quincy Market site also reported the highest eight-hour average CO concentration of 9.2 ppm, which exceeds the corresponding standards of 9 ppm. No other violations of the eight-hour standard were found, although the Martha Way site (LC1) at Leverett Circle, and the Gibb's Service Station site (BC3) at Bell Circle, recorded eight-hour average concentrations that are very close to exceeding the standard.

The field measurements conducted continuously at Kneeland Street and intermittently at Leverett Circle, the North End, Dewey Square, and Bell Circle indicate that existing 1982 one-hour CO concentrations are well under the standard. However, maximum eight-hour concentrations could exceed the 9-ppm standard in a number of locations in the study area where traffic congestion is severe.

To determine the impact of the project on NO_2 concentrations, a one-hour background concentration of 224 ug/m^3 for the Boston proper area and 170 ug/m^3 for the East Boston

Table 11

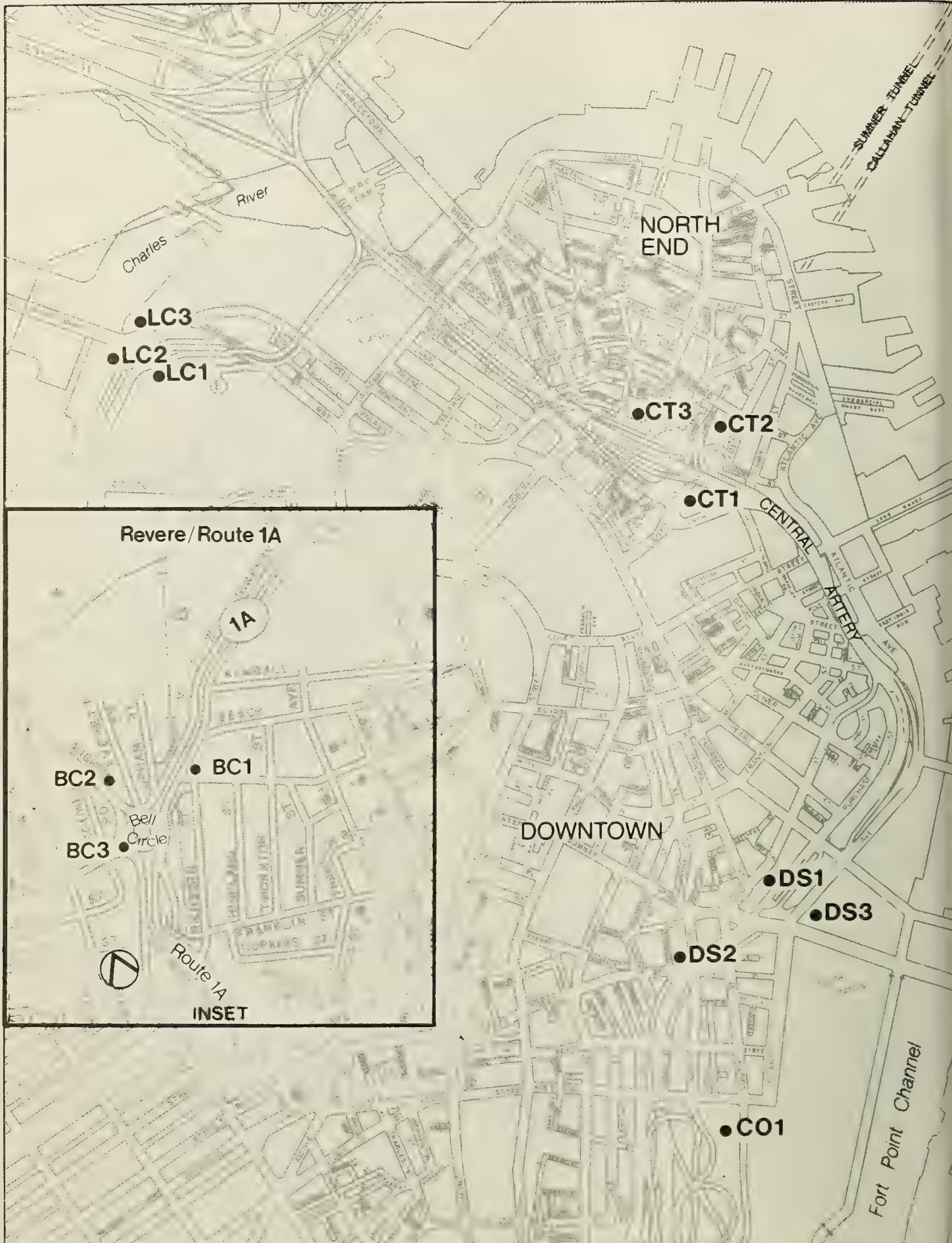
MEASURED CARBON MONOXIDE CONCENTRATIONS* (IN PPM)
FOR THE THIRD HARBOR TUNNEL AND
CENTRAL ARTERY STUDY AREA

Site ID**	Description	Period	Eight-Hour High	Eight-Hour Low	One-Hour High	One-Hour Low
CO1	Kneeland Street	01/06/82 through 03/29/82	4.4	0.5	7.0	0.5
	Leverett Circle++					
LC1	Martha Way	01/16/82 and	8.5/3.9	7.2/2.2	11.3/5.8	2.6/0.5
LC2	MDC Police Lot	04/13/82	3.7/5.4	3.4/4.1	5.7/6.6	1.4/3.1
LC3	DPW Parking		3.3/4.9	2.0/2.9	5.4/9.3	0.9/1.1
	North End/Callahan Tunnel++					
CT1	Quincy Market Garage	02/17/82 and	9.2/4.4	2.2/2.6	13.6/6.6	1.1/1.1
CT2	Fulton Street Parking	04/14/82	1.4/6.3	1.3/4.1	3.6/8.0	0.5/3.8
CT3	Hanover/Cross Street		7.6/3.5	5.2/2.7	9.5/5.9	3.0/0.5
	Dewey Square++					
DS1	Purchase Street	02/18/82 and	4.6/3.2	3.4/1.8	8.2/7.3	2.0/0.8
DS2	Lincoln/Essex Parking	04/15/82	6.1/2.4	4.0/2.0	8.1/4.4	2.4/0.5
DS3	Federal Reserve Bank		3.7/4.9	2.9/3.1	6.3/6.0	1.3/0.9
	Bell Circle++					
BC1	Dunkin Donuts	02/19/82 and	7.0/4.4	2.3/3.0	7.4/5.4	0.3/1.4
BC2	Kappy's Parking	03/26/82	5.1/3.0	3.3/2.6	7.8/3.7	1.1/1.7
BC3	Gibb's Service Station		9.0/3.7	1.7/0.8	10.5/4.6	3.7/0.6

*The one-hour and eight-hour standards are respectively 35 and 9 ppm.

**Refer to Figure 17 for the location of these sites.

++Data for the two days of short-term monitoring at Leverett Circle, the North End, Dewey Square, and Bell Circle are reported separately. For example, the eight-hour concentrations of 8.5/3.9 for the Martha Way site refer to the maximum eight-hour concentrations for this site on 16 February and 13 April 1982, respectively.



LC – Leverett Circle
CT – Callahan Tunnel/North End
DS – Dewey Square/South Station
CO – Kneeland Street
BC – Bell Circle (see inset)

Figure 17
Carbon Monoxide Measurement Locations

0 250 500 1000 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

area was established by DEQE. This was based on a review of limited historic monitoring data which was carried out during consultation for this study.

3.6 NOISE AND VIBRATION

3.6.1 Existing Noise Levels

Noise-sensitive land uses in the project area include residences, churches, schools, and parklands. The existing noise environment at these locations is generally dominated by motor vehicle traffic on expressways, major arterials or local streets, and in some cases by aircraft operations associated with Logan Airport.

The basic noise unit employed in this study is the decibel (dBA). The decibel is used to measure the relative noisiness of sounds; for example, a 3 dBA increase in noise level can just barely be perceived, while a 10 dBA increase corresponds to a subjective doubling of loudness. The relationship between changes in noise level and loudness is indicated in Table 12.

Since noise fluctuates from moment to moment, it is common practice to condense all this information into a single number, called the Equivalent Noise Level (L_{eq}). Many surveys show that the L_{eq} properly predicts annoyance, and thus this descriptor is commonly used for noise measurements, prediction, and impact assessment. As prescribed by FHWA, the L_{eq} for the noisiest traffic hour is used throughout this document to assess roadway noise impact. The FHWA noise criteria are summarized in Table 13. Noise abatement must be considered if project noise exceeds the noise abatement criteria based on activity category, or if the project will substantially increase the noise level at sensitive locations.

Noise measurements were made at 14 locations within the project area during May of 1982 in order to document the existing noise environment. These locations are shown in Figure 18 and are described in Table 14. At locations 1-13, short-term measurements were made in order to determine the existing daytime hourly L_{eq} at representative noise sensitive receptors. These receptors were chosen so as to include residences, institutions, and parks closest to project roads. (Table 55 in Section 4.8 NOISE AND VIBRATION identifies the number of residents represented by each receptor.) At location 14, near the Callahan/Sumner Tunnel toll plaza, the Hourly L_{eq} was monitored over a 24-hour period. The purpose of this latter measurement was to aid in the prediction of noise from the potential new toll plaza in East Boston. In April 1983, additional noise measurements were taken at locations 16-22, also presented on Figure 18.

The results of the noise measurement program are summarized in Table 14. These results indicate hourly daytime L_{eq} ranging from a low of 57 dBA to a high of 73 dBA at noise sensitive locations; such levels are typical for a daytime urban environment. Since aircraft noise is significant at some locations in the project area, measurement results in Table 14 are provided for locations 1-13 both with and without noise contribution from aircraft sources. In most instances, however, the increase in noise due to aircraft operations was measured to be less than 3 dBA, and therefore aircraft noise was not significant for most of the measurements.

Existing noise levels are observed to exceed the FHWA exterior noise criterion (67 dBA for Activity Category B) at several of the measurement locations. These locations, without the addition of aircraft noise, included Rotch Playground in the South End, Dockside Place Condominiums in South Boston near the Fort Point Channel, and several locations along Bremen Street in East Boston. With the addition of aircraft noise, the FHWA criterion was also exceeded at Porzio Park in the

Table 12

RELATIONSHIP BETWEEN CHANGES IN NOISE LEVEL AND LOUDNESS

Increase (or Decrease) in Noise Level	Loudness Multiplied (or Divided) by
3 dBA	1.2
6 dBA	1.5
10 dBA	2
20 dBA	4

Table 13

FHWA NOISE CRITERIA

NOISE ABATEMENT CRITERIA:

Activity Category	L_{eq} for Noisiest Traffic Hour	Description of activity category
A	57(Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purposes.
B	67(Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72(Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52(Interior)	Residences, motels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

CRITERIA FOR INCREASE IN NOISE LEVEL:

Increase (dBA)	Subjective Descriptor
0 - 5	No impact
5 - 10	Minor impact
10 - 15	Moderate impact
Greater than 15	Serious impact (substantial)

Table 14

SUMMARY OF EXISTING NOISE MEASUREMENTS

Site* No	Description	Daytime Hourly L_{eq} With Aircraft	Daytime Hourly L_{eq} Without Aircraft
1	Lester J. Rotch Playground: Approx. 120 ft. from ℄ Albany St.	69	69
2	St. Peter & Paul Church: Approx. 90 ft. from ℄ Dorchester Ave.	N.A.	63
3	Dockside Place Condominiums: 15 Sleeper St. (6th floor)	73	72
4	Boston Tea Party Museum: Approx. 100 ft. from ℄ Congress St.	65	64
5	Rear of No. 74-75 Frankfort St: Approx. 100 ft. from Orleans St.	57	55
6	Front of No. 120-122 Bremen St. (Between Porter St. & Gove St.)	68	68
7	Corner of Bremen St. & Porter St. (Near Residential Bldg.)	73	73
8	Front of Open Lot on Bremen St. (Between Marion St & Brooks St.)	69	67
9	Front of Open Lot on Bremen St. (Between Brooks St. & Putnam St.)	68	68
10	East Boston Recreation Area (At home plate of West Baseball Field)	65	61
11	East Boston Recreation Area (At home plate of East Baseball Field)	67	66
12	Front of No. 347 Maverick St. (Between Ardee St. & Lamson St.)	64	58
13	Porzio Park (Jeffries Point - East Boston)	69	62
14	Callahan/Sumner Tunnel Toll Plaza (Tpke. Authority Parking Lot)	**	--
15	Waterfront Park at Atlantic Avenue edge	***	***
16	Waterfront Park, 110 ft. from ℄ Atlantic Avenue, Approx. 270 ft. from ℄ Central Artery	69	69

Table 14 (Cont.)

SUMMARY OF EXISTING NOISE MEASUREMENTS

Site* No	Description	Daytime Hourly L_{eq} With Aircraft	Without Aircraft
17	Edward Everett House, Harvard St., Charlestown, Approx. 130 ft. from ℄ Rutherford Avenue	69	69
18	Charles River Dam Park, City Square, Charlestown, Approx. 300 ft. from ℄ Charlestown Bridge	69	69
19	Apartments, Stillman Place and Stillman Street, North End, Approx. 75 ft. from ℄ Central Artery	72	72
20	Casa Maria Housing, 7th Floor, Cooper St. & Lynn St., North End, Approx. 205 ft. from ℄ Central Artery	71	71
21	Quincy Market, Commercial Street and North Market Street, Approx. 25 ft. from ℄ Commercial St. and 135 ft. from ℄ Central Artery	71	71
22	Harbor Towers Parking Garage, 10th Floor level, Approx. 200 ft. from ℄ Central Artery	71	71

*See Fig. 18.
**See Table 15.
***Not Measured: future noise modeled

Figure 18
Existing Noise Measurement Locations

0 450 900 1800 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Jeffries Point neighborhood of East Boston. Sites 16-22 also exceed the FHWA noise level criterion.

Table 15 lists the hourly L_{eq} values measured over a 24-hour period next to the Callahan/Sumner Tunnel toll plaza (location 14). These levels were observed to vary between 62 dBA and 79 dBA, dominated by noise from accelerating vehicles. Traffic counts were also obtained for each measurement hour in order to calibrate the standard roadway noise prediction model for the special situation of a toll plaza facility.

3.6.2 Existing Vibration Levels

Vibration-sensitive land uses in the project area also include residential, commercial, institutional, and industrial buildings as well as existing MBTA subway tunnel structures. Concerns about vibration at such locations are related to potential structural damage, annoyance to building occupants, and/or interference with sensitive manufacturing processes.

The basic vibration descriptor used in this study is the Peak Velocity, expressed in "inches per second" (in./sec). This descriptor refers to the largest value of the velocity of a body's surface that occurs during the motion of that body (e.g., the ground, a building or tunnel component, etc.). The Peak Velocity has been found to relate well to structural damage, human vibration perception, and interference with the operation of very sensitive optical equipment. For example, vibration with a Peak Velocity of 0.005 in./sec would be just barely perceptible and could be disruptive to the operation of some sensitive precision instruments. Vibrations 10 times greater than the perception threshold (0.05 in./sec) would be characterized as strongly noticeable, while vibrations 100 times the perception threshold, (0.5 in./sec) would be characterized as very unpleasant. Vibrations 1000 times the perception threshold (5 in./sec) would begin to become intolerable to humans and wo be likely to cause minor structural damage to buildings. Figure 19 presents examples of the type of vibrations which result from differ activities. Vibration criteria use in this study are summarized in Tab 16.

Vibration measurements were made during April and June of 1982 April 1983 to document the existing vibration environment at 10 vibration-sensitive receptors withi the project area (see Figure 20 and Table 17). These included a residential area located above the MBTA Blue Line Tunnel in East Bosto (site A), the MBTA Red Line Tunnel below Fort Point Channel (site B), MBTA Blue Line Tunnel in East Bosto (site C), and the Gillette Co. facilities in South Boston (site D). Vibration measurements at six sensitive receptors near the Central Artery (sites E through J) represent residential, institutional and historical building sites.

The results of ground vibrati measurements near Bremen Street in East Boston (site A on Figure 20) indicate peak vertical ground vibration velocities ranging betweer 0.02 and 0.06 in./sec during subway train passages in the MBTA Blue Line tunnel below. These values are representative of existing vibratior experienced by some residences in th area. Inside buildings directly abo the subway tunnel, higher vibrations may actually occur due to amplifications resulting from floor and wall resonances. On the other hand, lower vibration levels would occur at increasing distances from t tunnel. In spite of these variation the results serve as a useful reference for comparison with project-generated vibration.

Vibration measurements made inside existing MBTA subway tunnels two locations indicated vibrations d to train passages are lowest on the tunnel ceiling. These vibration measurements will be used to determir impact, since they represent the

Table 15

VARIATION OF HOURLY L_{eq} OVER A 24-HOUR PERIOD* AT THE CALLAHAN/SUMNER TUNNEL TOLL PLAZA+

Hour of Day	Hourly L_{eq} (dBA)
Midnight - 1 a.m.	68
1 a.m. - 2 a.m.	65
2 a.m. - 3 a.m.	62
3 a.m. - 4 a.m.	65
4 a.m. - 5 a.m.	65
5 a.m. - 6 a.m.	68
6 a.m. - 7 a.m.	71
7 a.m. - 8 a.m.	71
8 a.m. - 9 a.m.	71
9 a.m. - 10 a.m.	73
10 a.m. - 11 a.m.	79
11 a.m. - 12 Noon	74
12 Noon - 1 p.m.	75
1 p.m. - 2 p.m.	74
2 p.m. - 3 p.m.	75
3 p.m. - 4 p.m.	71
4 p.m. - 5 p.m.	71
5 p.m. - 6 p.m.	70
6 p.m. - 7 p.m.	69
7 p.m. - 8 p.m.	68
8 p.m. - 9 p.m.	70
9 p.m. - 10 p.m.	72
10 p.m. - 11 p.m.	71
11 p.m. - Midnight	70

*14 May 1982.
+Measurement Site No. 14 (See Fig. 18).

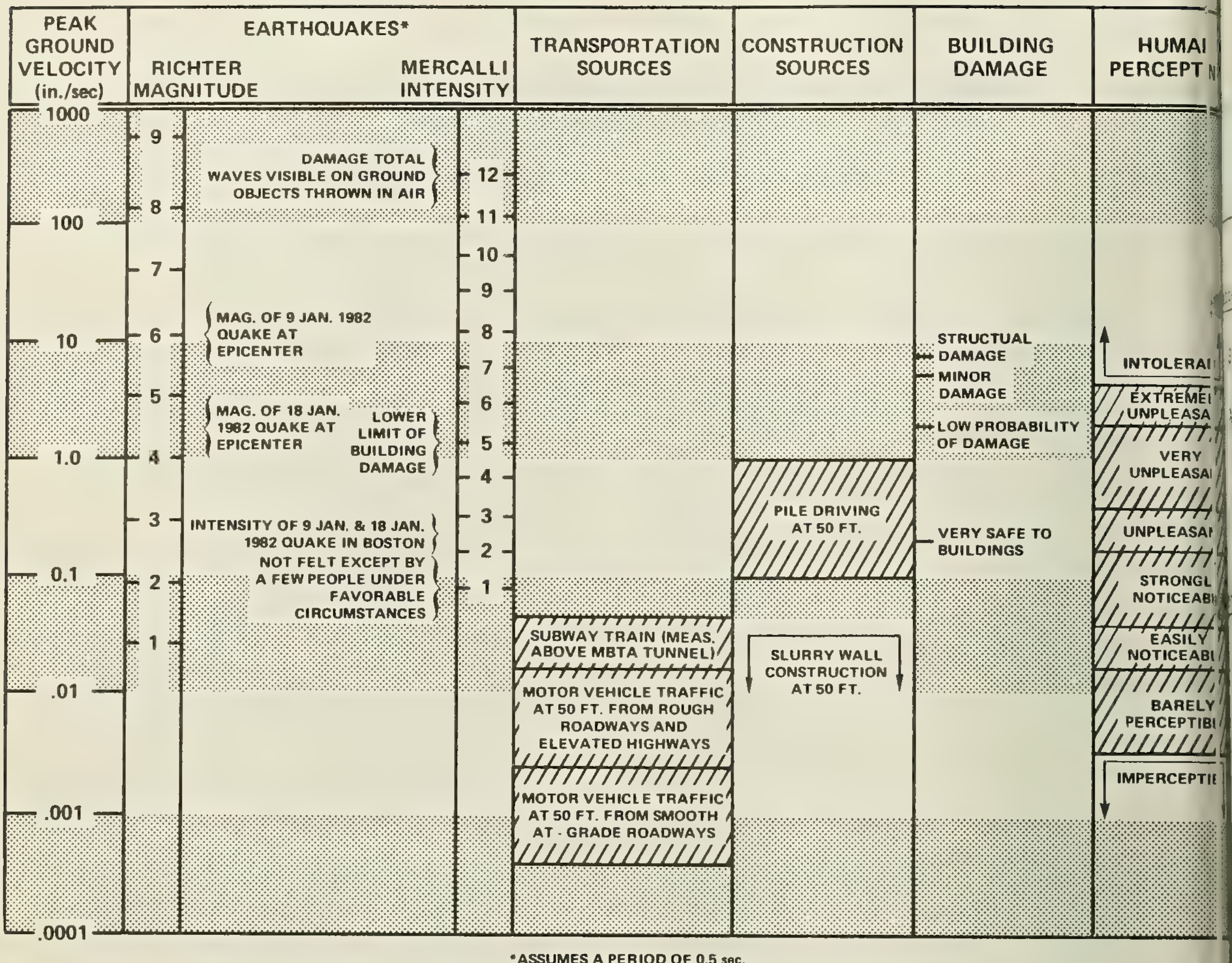


Figure 19

Comparison of Typical Ground Vibration Amplitudes and Criteria

EIS/EIR for I-90 — Third Harbor Tunnel; I-93 — Central Artery

Table 16

PROJECT VIBRATION CRITERIA*

Type of Effect	Maximum Peak Vibration Velocity+ (in./sec)
ge Effects	
Structural Damage	1.9
Architectural Damage	
-Historical Buildings	0.08
-Non-Historical Residential Buildings	0.2
yance Effects	
Hospital and Critical Areas	0.005
Residential/Institutional/Hotel	
-Construction Period	0.01
-Long Term	0.007
Office	0.02
Factory	0.04

*aximum existing vibrations serve as supplementary criteria to the
alues listed in this table.

+efers to ground vibration in the case of damage effects and building
ibration in the case of annoyance effects.

Table 17

SUMMARY OF EXISTING VIBRATION MEASUREMENTS

Site* No.	Description	Range of Peak Vibration Velocity (in./sec.)	Major Vibration Sources
A	Sidewalk outside 144 Bremen Street, above the Blue Line Subway Tunnel	0.020 - 0.060	Subway trains
B	Ceiling inside MBTA Red Line Subway Tunnel below Fort Point Channel	0.014 - 0.042	Subway trains
C	Ceiling inside MBTA Blue Line Subway Tunnel below Porter St. (East Boston)	0.016 - 0.095	Subway trains
D	Floors inside Gillette Company Bldgs. (South Boston)	0.004 - 0.031	Normal building activities
E	Sidewalk outside Baine Bldg. at 394 Atlantic Ave.	0.011 - 0.066	Street traffic, foot-steps, building construction.
F	Sidewalk outside bldg. at corner of State St. and Surface Artery	0.011 - 0.056	Street and expressway traffic, footsteps
G	Sidewalk outside North Market Bldg. at Quincy Market, near corner of Clinton St. and Commercial St.	0.010 - 0.027	Motor vehicles and pedestrian traffic
H	Sidewalk outside North End Nursing Home, at building corner nearest Richmond St. and Callahan Tunnel portal	0.010 - 0.040	Motor vehicle and pedestrian traffic
I	Sidewalk outside apartment between Nos. 2 & 3 Still-man Pl. on east side of expressway (North End)	0.007 - 0.016	Street and expressway traffic
J	Ground outside new wing of Mass. Rehabilitation Hos-pital, approx. 15 feet from nearest North Station railroad track	0.017 - 0.470	Commuter train movements

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* See Fig. 20

Letters represent vibration measurement locations identified in text.

Figure 20
Vibration Measurement Locations

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

smallest existing vibrations and since the ceiling is likely to be the part of the tunnel structure most susceptible to damage from highway tunnel construction. Therefore, these results serve as a useful baseline for comparison with future project generated vibrations.

Vibration measurements were also performed at the Gillette Company facilities in South Boston (site D on Figure 20) in order to document existing levels of building vibration at 11 locations near potentially sensitive equipment. Vibration sensitive equipment included electron microscopes, metalographs, grinding machines, surface analyzers, blade sharpeners, hardness testers, and scales. Measurement results indicate maximum values of peak vertical floor vibration velocities ranging between 0.004 in./sec and 0.031 in./sec, with the greatest vibrations occurring in the building closest to the Fort Point Channel.

The measurement results in the vicinity of the Central Artery at sites E through J (summarized in Table 17) indicate that in most cases, maximum existing peak ground vibration velocities fall within the range between 0.01 and 0.10 in./sec. These velocities are within the perceptible to strongly perceptible range, and are caused principally by motor vehicle traffic on surface and elevated roadways. At site J (Spaulding Rehabilitation Hospital), measured peak ground vibration velocities due to commuter train movements also fell within this range, with the exception of one event. This event consisted of an MBTA commuter train movement on the track closest to the measurement position (15 feet away) and resulted in a peak velocity of 0.47 in./sec.

In the absence of major identifiable vibration sources, minimum peak ground vibration velocities at sites E through J were observed to range between 0.001 and 0.005 in./sec, generally not perceptible to barely perceptible, depending on the measurement location.

3.7 WATER RESOURCES

This section summarizes data concerning the physical, chemical, biological oceanographic environment in the project area. Also included a discussion of industrial users of the water of Fort Point Channel and nearby parts of Boston Harbor. The data were obtained from investigati conducted during 1982 and 1983.

The Massachusetts Division of Water Pollution Control (DWPC) has classified Boston Inner Harbor as Class SC. Class SC waters are suitable for aesthetic enjoyment, th protection and propagation of marine life, and secondary contact recreati Specific water quality standards applicable to SC waters include a minimum dissolved oxygen concentrati of 6.0 milligrams/liter (mg/l), a pH range of 6.5 to 8.5, and maximum fec coliform bacteria count of 1000 organisms per 100 milliliters of sample. The Charles River is classified as Class C water (also suitable for propagation of fish and marine life and secondary water contact recreation).

3.7.1 Fort Point Channel

Tides and Currents

The tidal water area of the Fort Point Channel upstream of the Northern Avenue Bridge is 2.26 milli square feet (approximately 52 acres). Since the sides of the Channel are essentially vertical and consist of revetments and bulkheads, there is n real difference in area between high tide and low tide. The Channel is approximately 5600 feet in length, approximately 560 feet wide at its mouth, and the length of tidal excursion is approximately 2100 feet (Tidal excursion represents the distance a particle of water will travel on an ebb or flood tide.) Th mean tidal prism (water volume betwe mean low and mean high tide) is 21.5 million cubic feet, while the spring tidal prism is 24.9 million cubic fe (the spring tide generally occurs every two weeks when the moon is new

full). As in other harbor areas, e range of the spring tide is proximately 11 feet, while the mean gh tide range is 9.5 feet. mputations indicate that the Channel flushed once in every 2.1 full tide cles (approximately every 26 ours). Computations also indicate at the average current velocity of ater entering or leaving the Channel the Northern Avenue Bridge is pproximately 0.1 feet per second fps).

ater Quality

Water quality conditions in the ort Point Channel are highly ariable. During non-storm conditions, ater quality is similar to that of he Inner Harbor (Table 18). However, uring storms, combined sewer verflows contribute high levels of acteria, solids, biochemical oxygen emand, nutrients, and metals to the ater, and cause violations of Class C water quality standards. Water in he Fort Point Channel is, however, uitable for fish and other marine ife, boating, and industrial cooling ater. Figure 21 presents the ocations of water quality sampling ites in Boston Harbor.

ediments

Figure 22 shows locations of site-specific sediment sampling locations undertaken for the proposed tunnel alignment.

The chemical and physical conditions of bottom sediments in the Fort Point Channel were determined through a review of existing data as well as site-specific investigations. These show high levels of metals and petroleum residuals in the Channel.

All surface sediments in the Channel are found to be Category 3 (highly contaminated) quality, with the most contaminated area located between Dorchester Avenue and Summer Street. While the quality of surface sediments is significantly degraded, this condition is only found in the upper 2-3 feet. Below this depth, sediments are relatively uncontaminated, and most are of Category 1 (uncontaminated) quality. The sediment quality at various depths at Station FP-2, as an example, is shown in Figure 23. Extraction Procedure Toxicity Testing on Fort Point Channel sediments indicated they are non-hazardous, including no hazardous levels of PCBs. A summary of sediment characteristics is presented in Table 19.

Marine Life

Marine life found in the Fort Point Channel includes flounder, stickleback, mummichog, smelt, alewife, eel, and others which may enter the Channel from the Harbor. The diversity of marine life living in the bottom sediments is low, with a high preponderance of pollution-tolerant worms. Filamentous algae are the dominant species of marine vegetation in the Channel.

3.7.2 Boston Inner Harbor

Tides and Currents

Measurements of current speed and direction were conducted at four locations on a spring (high) and neap (low) tide cycle during March 1982. Those data have been reviewed for application to the alignment for the Preferred Alternative, and the conditions have not been found to differ significantly. Data from meter Stations A and B indicate peak velocities of 1.0 feet per second (fps) during spring tides. The predominant velocities ranged from 0.10 to 0.26 fps. During ebb tide, the higher current velocities occurred near the surface. During flood tide, the higher current velocities were found to occur in the middle and bottom of the water column.

Computations indicate that water within the project area will travel approximately 5600 feet on the ebb tide and approximately 7000 feet on the flood tide (see Figure 24). The flood tide excursion will carry water from the project's cross-harbor

Table 18

WATER QUALITY SUMMARY BOSTON INNER HARBOR
(mg/l)

Parameter	Maximum	Minimum	Average
pH[1]	8.0	7.6	7.8
Suspended Solids[1]	35.0	16.0	22.0
Oil and Grease[1]	2.6	0.0	1.3
Total Kjeldahl Nitrogen[1]	2.4	0.64	1.23
Ammonia Nitrogen[1]	0.19	0.01	0.07
Sulfate[1]	3,325	1,950	2,488
Total Phosphorus[1]	0.10	0.02	0.05
Conductivity[1] (μmhos/cm)	40,000	34,000	38,800
Total Coliform[1] (# organisms/100 ml)	2,400	230	711[3]
Fecal Coliform[1] (# organisms/100 ml)	380	20	105[3]
Chloride[1]	14,000	11,000	13,300
Arsenic[2]	0.001	-	0.001
Cadmium[2]	0.014	0.0005	0.009
Chromium[2]	0.004	-	0.004
Copper[2]	0.01	0.0014	0.006
Lead[2]	0.017	0.002	0.012
Mercury (μg/l)[2]	0.05	0.005	0.035
Nickel[2]	0.02	0.004	0.016
Silver[2]	0.08	-	0.08
Vanadium[2]	0.04	-	0.04
Zinc[2]	0.145	0.002	0.05
Dissolved Oxygen[1]			
Surface	8.5	5.2	7.2
Middle (13'-18')	6.8	5.4	5.9
Bottom (26'-40')	6.8	3.4	5.5

Sources:

1 Massachusetts Department of Environmental Quality Engineering from sampling locations BH03 (Boston Inner Harbor north of mouth of Charles River near U.S. Naval Reserve), BH04 (tidal portion of Charles River downstream of Charlestown Bridge) and BH05 (Main Channel of Boston Inner Harbor near mouth of Fort Point Channel) surveyed July 14-15, 1982, Personal Communication.

2 U.S. Army Corps of Engineers, 1981 and Massport Seaport Development, 1980.

3 Geometric mean of DWPC Data

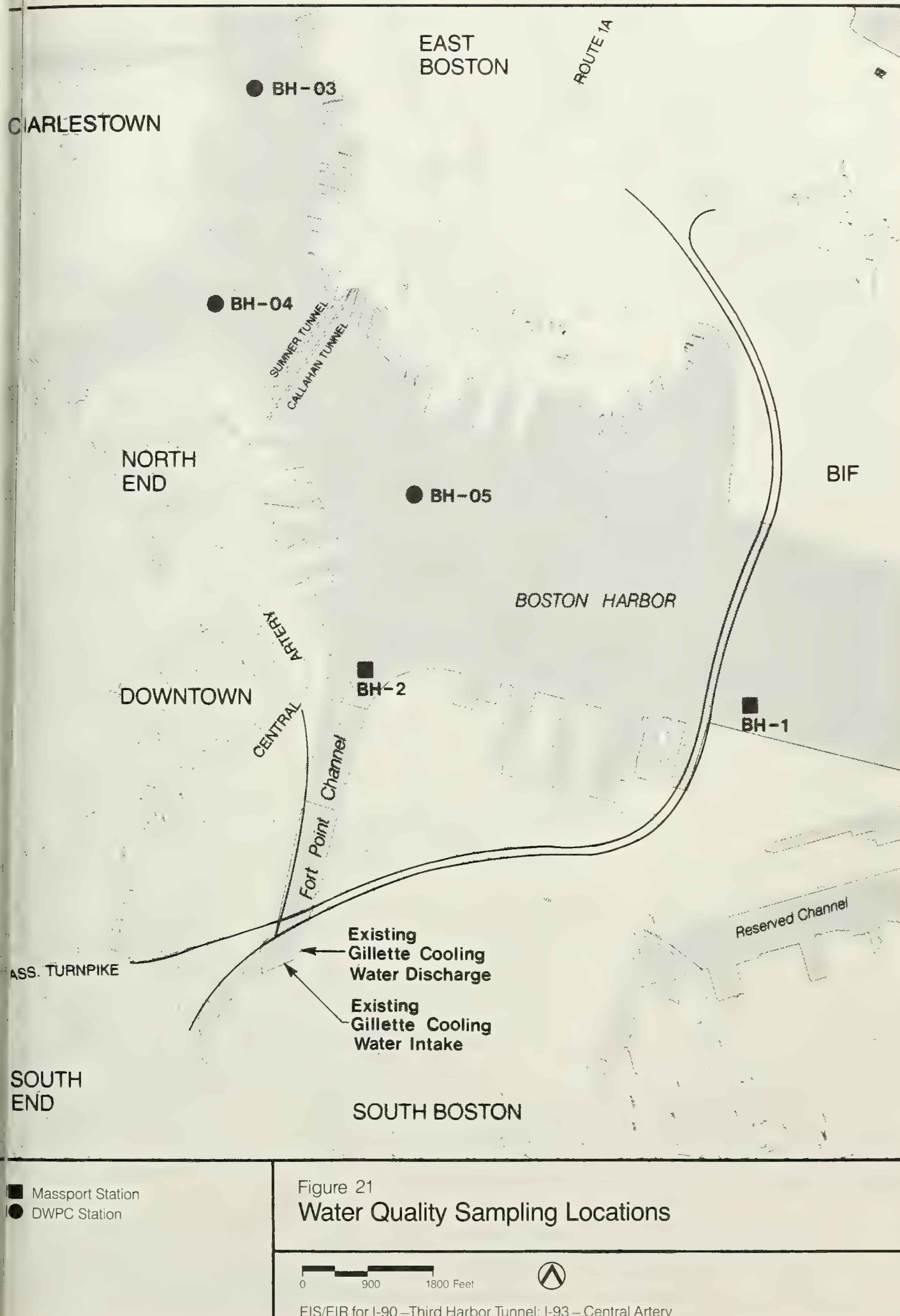
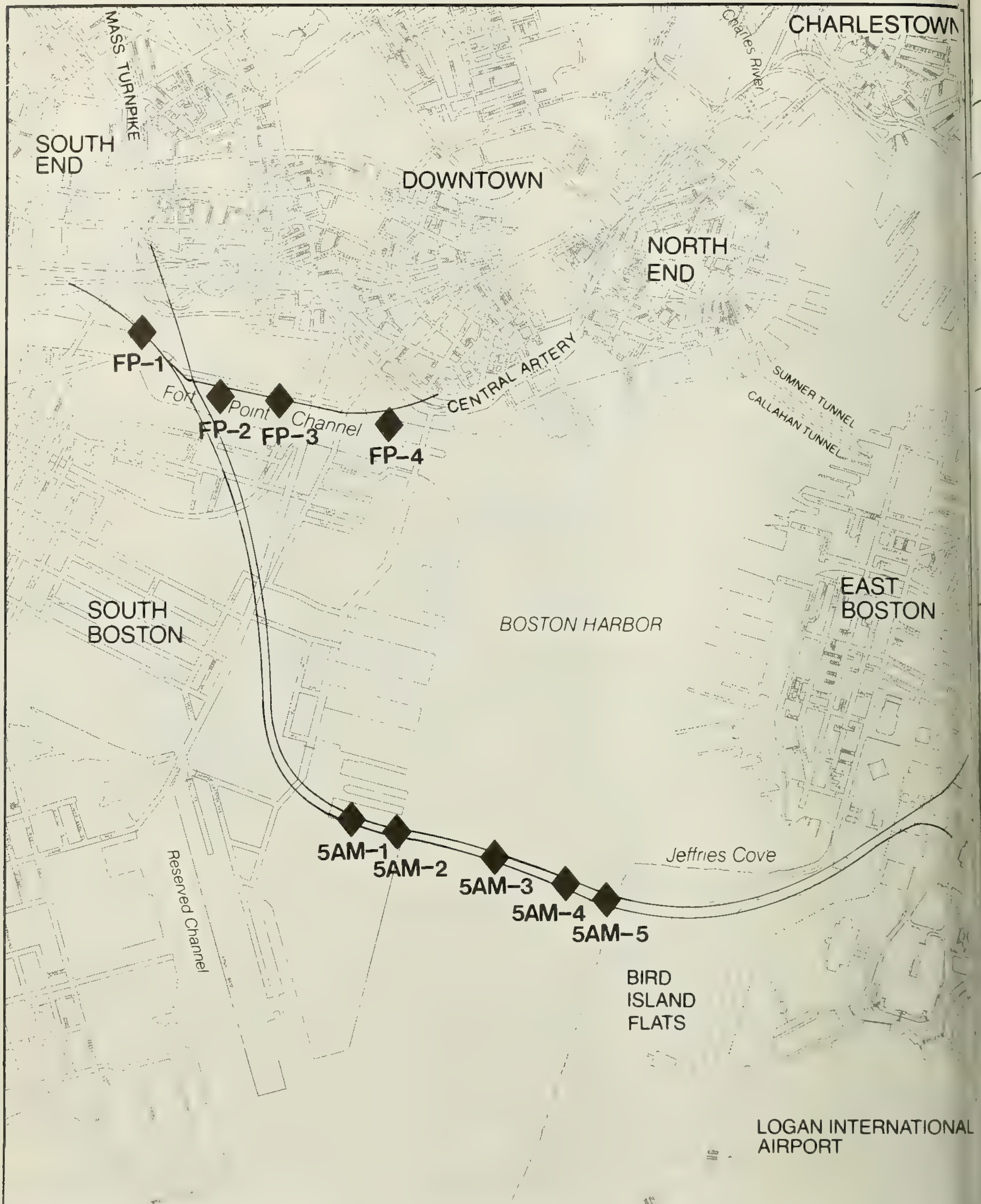


Figure 21
Water Quality Sampling Locations

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

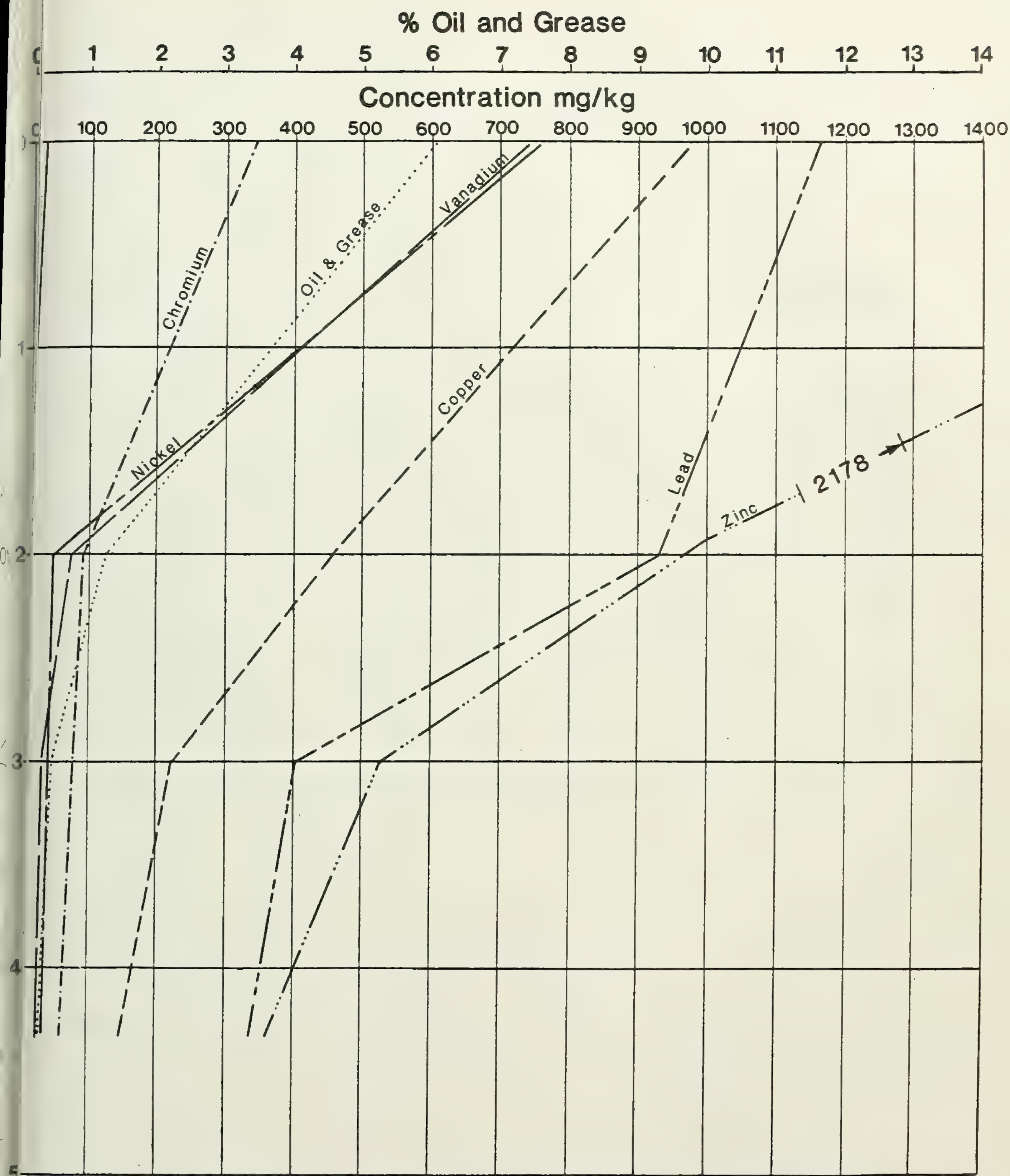


FP Fort Point Channel
5AM Third Harbor Tunnel

Figure 22
Sediment Sampling Locations

0 900 1800 Feet

EIS.EIR for I-90 –Third Harbor Tunnel, I-93 - Central Artery



Fure 23
ɪrtical Distribution of Metals in Fort Point Channel Sediments at Station FP-2
E/EIR for I-90 — Third Harbor Tunnel; I-93 — Central Artery

Table 19

AVERAGE SEDIMENT CHARACTERISTICS

		FORT POINT CHANNEL								
		SOUTH BAY			DORCHESTER AVE TO SUMMER ST			SUMMER ST TO NORTHERN AVE		
PARAMETER		SURFACE	MUD	SILT/CLAY	SURFACE	MUD	SILT/CLAY	SURFACE	MUD	SILT/CLAY
ARSENIC	mg/kg	107.65	32.20	39.80	125.00	85.37	74.70	44.45	5.80	3.20
CADMIUM	mg/kg	12.70	6.25	3.00	29.75	6.77	2.35	7.75	2.25	1.80
CHROMIUM	mg/kg	107.25	26.65	12.00	292.45	79.80	56.00	176.03	20.95	2.70
COPPER	mg/kg	302.10	158.49	12.00	762.05	361.83	167.40	298.75	195.30	106.90
LEAD	mg/kg	1026.40	429.70	37.90	1041.30	687.77	353.00	431.40	147.25	22.10
MERCURY	mg/kg	20.30	0.68	0.07	3.94	2.10	3.36	3.41	3.13	5.11
NICKEL	mg/kg	80.80	39.50	16.30	1199.35	48.70	32.25	55.80	37.60	36.20
VANADIUM	mg/kg	157.40	32.50	16.90	505.35	56.67	34.35	197.03	4.20	0.40
ZINC	mg/kg	1707.00	453.00	102.40	1906.80	802.47	505.80	495.55	417.80	229.80
PCB	mg/kg	<.005			<.005			0.01		
PEST.	mg/kg	<.005			<.005			<.005		
P/TOTAL	mg/kg	57.00	17.05	2.80	101.50	44.43	55.20	44.20	53.50	67.60
N/AMONIA	mg/kg	115.20	169.15	87.00	58.85	149.60	117.35	11.70	451.80	974.40
TKN	mg/kg	1562.50	834.15	661.30	592.35	1029.57	1051.15	278.90	2014.00	1601.20
SOLIDS/T	%	27.90	69.40	77.50	29.65	53.37	53.35	40.60	52.25	33.50
SOLIDS/V	%	21.40	27.65	33.60	25.35	11.83	7.15	10.10	9.50	3.20
O&G	%	5.11	1.00	0.17	5.05	0.83	0.27	1.11	1.04	0.46
SILT/CLAY	%	99.00	99.00	99.00	99.00	99.00	99.00	99.00	99.00	99.00
WATER CNT	%	76.20	30.60	22.50	70.35	46.50	46.65	59.40	47.75	66.50
BASE/NEUT	mg/kg	<1	<1		<1	<1		<1	<1	

Figure 24
Flood/Ebb Excursion

0 450 900 1800 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

tunnel alignment north to the vicinity of the Callanan/Sumner Tunnel. The ebb excursion will reach past the mouth of the Reserved Channel.

Water Quality

Existing water quality information on the Harbor indicates that Class SC standards are not consistently met. In past and present monitoring programs by both Massport and the Massachusetts Division of Water Pollution Control, dissolved oxygen concentrations in Inner Harbor water have been lower than the minimum 6.0 mg/l required for Class SC water. Existing water quality data are summarized in Table 18.

Freshwater discharges from the Charles and Mystic Rivers can have a marked effect on salinity of the Inner Harbor. Water quality of the Inner Harbor, particularly for such parameters as bacteria, suspended solids, nutrients, and metals, is affected during storms when the discharges of combined sewer overflows are most prevalent. However, there are no CSO's in the areas of South and East Boston where subaqueous tunnel construction is proposed. The West Airfield drainage outfall from Logan Airport is the only source of stormwater runoff adjacent to the project. Consequently overall water quality conditions are expected to be better than those prevailing further into the Harbor.

Sediments

The physical and chemical characteristics of bottom sediment within the project area were determined through an evaluation of existing data as well as site-specific investigations. The overall Harbor bottom is covered with a layer of organic mud which varies in depth from almost totally absent in the main shipping channel to 4.5 feet in depth east of the mouth of the Fort Point Channel. Portions of the main shipping channel are virtually devoid of organic sediment, probably due to tide, currents, and ship traffic passing through the channel. Where does exist, the quality of organic sediment is variable. Lower concentrations of contaminants are found in the shipping channel, but most surface organic sediments were found to be contaminated and of Category 3 quality. Clean sediments were found in the deeper muds and in the Harbor clay layer. Relatively uncontaminated conditions, in genera were found at depths of 2-3 feet bel the Harbor bottom.

In order to characterize the material along the alignment of the Preferred Alternative, surface sediment samples were taken at five stations (see Figure 22). Deeper sediments were recovered from three these locations (5AM-2, 5AM-4 and 5AM-5). Table 20 presents the resul of these analyses.

The data for these samples confirms the general trends observed in other data on Boston Harbor sediments. Channel and pier end sediments (5AM-2, 5AM-3 and 5AM-4) a generally cleaner than other locatio (5AM-1 and 5AM-5). Deeper sediments are generally cleaner than upper sediments. In general, however, the sediments between the new embankment for the Massport container port fill and the drydock at the Boston Marine Industrial Park (5AM-1 and 5AM-2) ar all of Category 2 and 3 quality and are contaminated with arsenic, cadmium, and mercury. Similar conditions are found in surface sediments along the remainder of the Preferred Alternative alignment (5AM-3, 5AM-4 and 5AM-5). Significa improvement in sediment quality is found in deeper materials such that depths of three feet Category 1 sediments are found.

Elutriate analyses were conducted to determine the degree to which metals and nutrients would be released to Harbor water during dredging. The analyses indicate greatest and most consistent release took place from surface sediments. The metals most consistently releasec include arsenic, cadmium, lead and

Table 20

BULK SEDIMENT ANALYSIS

WATER QUALITY LABORATORY
ANALYSIS REPORT

PROJECT: THIRD HARBOR TUNNEL
PROJ/NO: 141

244 SECOND AVENUE
WALTHAM, MA 02154
617/890-3737

STATION:		SAM-1		SAM-1		SAM-2		SAM-2		SAM-3	
DATE:		8/2/83		8/10/83		8/2/83		8/10/83		8/2/83	
SAMPLE#:		6887		6891		6889		6893		6890	
TYPE OF ANALYSIS:		BULK		BULK		BULK		BULK		BULK	
SEDIMENT DEPTH:		SURF		3.2-4.0'		SURF		3.4-4.0'		SURF	
		CONC	CLASS	CONC	CLASS	CONC	CLASS	CONC	CLASS	CONC	CLASS
ARSENIC	mg/kg dry wt.	35.6	3	13.84	2	37.9	3	17.42	2	25.1	3
CADMIUM	mg/kg dry wt.	7.41	2	1.78	1	3.29	1	2.58	1	3.54	1
CHROMIUM	mg/kg dry wt.	31.8	1	25.91	1	25.6	1	31.7	1	18.7	1
COPPER	mg/kg dry wt.	18.1	1	18.78	1	10.5	1	25.18	1	10	1
LEAD	mg/kg dry wt.	52.2	1	44.51	1	43.6	1	51.02	1	27.2	1
MERCURY	mg/kg dry wt.	.88	2	.59	2	.77	2	.61	2	.91	2
NICKEL	mg/kg dry wt.	1.02	1	1.78	1	1.74	1	2.59	1	1.18	1
VANADIUM	mg/kg dry wt.	51.9	1	118.61	2	30.6	1	137.47	3	39.4	1
ZINC	mg/kg dry wt.	106	1	90.81	1	71	1	111.26	1	56.1	1
PCB	mg/kg dry wt.	.005	1	.005	1	.005	1	.005	1	.005	1
DDT*	mg/kg dry wt.	.005	N/A	.005	N/A	.005	N/A	.005	N/A	.005	N/A
P/TOTAL	mg/kg dry wt.	90.9	N/A	99.03	N/A	106	N/A	71.52	N/A	65.3	N/A
N/AMMONIA	mg/kg dry wt.	32.9	N/A	366	N/A	61.5	N/A	229.6	N/A	63.4	N/A
PHENOLS	mg/kg dry wt.	.047	N/A	.301	N/A	.02	N/A	.329	N/A	.02	N/A
TKN	mg/kg dry wt.	23.8	N/A	706	N/A	20.3	N/A	418	N/A	26.8	N/A
SOLIDS/T	%	34.1	N/A	30.2	N/A	33.7	N/A	30.31	N/A	35.8	N/A
SOLIDS/V	%	9.7	2	7.87	2	8.73	2	9.64	2	8.25	2
O&G	%	.74	2	1.17	3	.7	2	1.44	3	.21	1
SILT/CLAY	%	67	2	54	1	94	3	66	2	94	3
WATER CNT	%	65.9	3	69.8	3	66.3	3	69.69	3	64.2	3

STATION:		SAM-4		SAM-4		SAM-5	
DATE:		8/2/83		8/10/83		8/2/83	
SAMPLE#:		6886		6892		6888	
TYPE OF ANALYSIS:		BULK		BULK		BULK	
SEDIMENT DEPTH:		SURF		3.5-4.0'		SURF	
		CONC	CLASS	CONC	CLASS	CONC	CLASS
ARSENIC	mg/kg dry wt.	24.2	3	17.46	2	32.2	3
CADMIUM	mg/kg dry wt.	4.75	1	2.1	1	7.53	2
CHROMIUM	mg/kg dry wt.	21.1	1	38.3	1	31.4	1
COPPER	mg/kg dry wt.	11.9	1	18.62	1	1.64	1
LEAD	mg/kg dry wt.	40.5	1	49.87	1	65.8	1
MERCURY	mg/kg dry wt.	.74	2	.63	2	.66	2
NICKEL	mg/kg dry wt.	1.62	1	3.16	1	1.64	1
VANADIUM	mg/kg dry wt.	41.7	1	109.24	2	51.6	1
ZINC	mg/kg dry wt.	62.2	1	115.73	1	93.3	1
PCB	mg/kg dry wt.	.005	1	.005	1	.005	1
DDT*	mg/kg dry wt.	.005	N/A	.005	N/A	.005	N/A
P/TOTAL	mg/kg dry wt.	89.5	N/A	84.52	N/A	71.6	N/A
N/AMMONIA	mg/kg dry wt.	125	N/A	304	N/A	21.9	N/A
PHENOLS	mg/kg dry wt.	.59	N/A	.288	N/A	.02	N/A
TKN	mg/kg dry wt.	29.3	N/A	407	N/A	19.3	N/A
SOLIDS/T	%	36.4	N/A	28.15	N/A	44.3	N/A
SOLIDS/V	%	9.16	2	7.34	2	8.45	2
O&G	%	.64	2	.76	2	1.23	3
SILT/CLAY	%	82	2	54	1	91	3
WATER CNT	%	63.6	3	71.85	3	55.7	2

*INCLUDING DDT, DDD, DDE, AND ELDRIN
ALL CONCENTRATIONS EXPRESSED ON DRY WEIGHT BASIS

CARLTON L. NOYES

zinc. Total phosphorus, ammonia nitrogen, and Kjeldahl nitrogen were also released in high quantities. The data did not indicate a general decline in concentrations of released constituents as had been found in other locations in the harbor. Results of the elutriate analyses are presented in Table 21.

Marine Life

Ninety micro-benthic species have been found inhabiting the Inner Harbor. Polychaete worms dominate the benthic community with such pollution tolerant species as Capitella capitata and Polydora ciliata the major dominants. Samples collected for this project indicate the highest density of pollution tolerant worms are found in the Fort Point Channel and Jeffries Cove.

In addition, nearly four dozen species of finfish have also been observed in Boston Harbor waters.

One of the most common permanent inhabitants of the Inner Harbor is winter flounder which appears to stay in particular areas, such as the Outer Harbor, Dorchester Bay, and adjacent coves and inlets. Of the seasonal residents, rainbow smelt and blueback herring are prevalent in the early spring, with alewife present during the early summer. Flounder spawn extensively in Boston Harbor; the Boston Conservation Commission, in its Order of Conditions for several recent projects, has imposed an annual moratorium on dredging projects from February 1 to May 15 to protect the flounder's reproductive season.

No harvestable shellfish beds exist within the area of the proposed tunnel alignment. A limited number of soft-shell clams are found adjacent to the CSO in Jeffries Cove. Because of the high coliform bacteria concentrations in the water, the collection of any shellfish from this area for consumption is prohibited.

The closest active clam flats are those north and east of Logan International Airport, which are periodically open only to Master Diggers for commercial harvesting. Such harvesting must be followed by depuration (flushing in a clean environment).

Both green and brown algae are common within the Inner Harbor. Fucus (rockweed) and Ulva (sealettuce) are found on rocks, shells, and pilings in the area.

Species of marine mammals periodically found in the Harbor include the harbor seal, harbor porpoise, and grampus.

3.7.3 Lower Charles River Basin

Water Quality

Recent water quality data upstream and downstream of the new Charles River Dam are available from the MDC and Massachusetts Division of Water Pollution Control. MDC data collected upstream of the new dam near the MBTA railroad bridge (Table 22) indicated the water had a light amber color, with low turbidity, and acceptable levels of pH, dissolved oxygen, BOD, and fecal coliform bacteria. Total phosphorus concentrations clearly indicate nutrient enrichment. While stratified testing, also conducted by the MDC, indicates isothermal conditions above the new dam, there is a clinograde oxygen curve (concentrations decreasing with depth) where at a depth of 25 feet, dissolved oxygen in July was below the 5.0 mg/l minimum for Class C water. Specific conductance data for May 1982 indicate somewhat more saline water at the bottom than at the surface.

DWPC data for 1982 (Table 23) in the tidal portion of the Charles River below the new dam also indicate declining oxygen concentrations. Microbiological conditions between the two data sources are generally

Table 21

ELUTRIATE ANALYSIS

WATER QUALITY LABORATORY
ANALYSIS REPORT

…ECT: THIRD HARBOR TUNNEL
…/NO: 141

244 SECOND AVENUE
WALTHAM, MA 02154
617/890-3737

…ION:		SAM-1	SAM-1	SAM-2	SAM-2	SAM-3
… OF ANALYSIS:		7/26/83	8/10/83	7/26/83	8/10/83	7/25/83
…LE #:		6887E	6891E	6889E	6893E	6890E
… OF ANALYSIS:		ELUTRIATE	ELUTRIATE	ELUTRIATE	ELUTRIATE	ELUTRIATE
…MENT DEPTH:		SURFACE	3.2-4.0'	SURFACE	3.4-4.0'	SURFACE
…ENIC	mg/l	.398	.914	.392	.969	.355
…IUM	mg/l	.06	.008	.054	.011	.054
…MIUM	mg/l	<.01	.01	.01	.01	.01
…PER	mg/l	.001	.005	.001	.004	.01
…D	mg/l	.809	.452	.772	.45	.736
…CURY	ug/l	<.2	<.2	<.2	<.2	<.2
…KEL	mg/l	.01	.01	.01	.01	.01
…ADIUM	mg/l	.01	.019	.01	.013	.01
…C	mg/l	.04	.077	.03	.035	.04
…OTAL	mg/l	.002	.13	.002	.08	.02
…AMMONIA	mg/l	.654	1.42	.684	1.29	1.23
…	mg/l	3.25	7.25	2.93	5.44	2.51
…	mg/l	9.2	9	9.4	24	9
…NOLS	mg/l	.006	.009	.01	.004	.007
…	ug/l	<.005		<.005		<.005
…	ug/l	<.005		<.005		<.005

…TION:		SAM-4	SAM-4	SAM-5	REC.WATER
…TE OF ANALYSIS:		7/26/83	8/10/83	7/26/83	8/10/83
…MPLE #:		6886E	6892E	6888E	6887RW
…PE OF ANALYSIS:		ELUTRIATE	ELUTRIATE	ELUTRIATE	REC.WATER
…DIMENT DEPTH:		SURFACE	3.5-4.0'	SURFACE	
…SENIC	mg/l	.405	.928	.407	.01
…DMIUM	mg/l	.06	.01	.056	.035
…ROMIUM	mg/l	< .01	.01	<.01	<.01
…PPER	mg/l	.001	.003	.001	.02
…AD	mg/l	.708	.479	.708	.06
…RCURY	ug/l	< .2	< .2	<.2	<.2
…CKEL	mg/l	.01	.01	.01	.098
…NADIUM	mg/l	.01	.006	<.01	.01
…NC	mg/l	.035	.065	.04	.053
…TOTAL	mg/l	.006	.14	.18	.065
…AMMONIA	mg/l	1.04	1.42	.582	.17
…N	mg/l	3.37	6.92	6.51	1.92
…G	mg/l	8.8	6.4	9.8	7.6
…ENOLS	mg/l	.003	.001	.007	.001
…B	ug/l	<.005		.005	.005
…T	ug/l	<.005		.005	.005

Carlton L. Noyes

CARLTON L. NOYES

Table 22

CHARLES RIVER WATER QUALITY
UPSTREAM OF NEW CHARLES RIVER DAM

Date/ Station	Temperature (C)	Color (Units)	Turbidity (NTU)	Specific Conduct. (µmhos/cm)	Salinity (ppt)	pH	DO (mg/l)	BOD (mg/l)	Cl (mg/l)	Total P (mg/l)	Total Col /100 ml	Fec Col /100 ml
4/2/82												
Surface	5	30	1.5	350	0	7.2	11.8	1.9	150	0.05	2300	280
5/20/82												
Surface	16			700	0	7.7		8.5				
10 ft	16			700	0	7.7		8.4				
20 ft	15			2500	1	7.6		8.0				
6/4/82												
Surface	14	25	1.0	600	<1	6.9	8.0	1.8	450	0.04	4900	700
7/21/82												
Surface	22			1300	1	7.0	5.3					
15 ft	22			1500	1	6.9	5.2					
25 ft	22			1800	1	6.9	4.7					
8/31/82												
Surface	15	20	1.5	700	<1	7.6	9.6	1.9	920	0.05	--	190
10/29/82												
Surface	13			410	0		9.3					
15 ft	13			500	0		8.5					
25 ft	14			650	<1		6.5					

Source: Metropolitan District Commission, 1982

Table 23

WATER QUALITY SUMMARY

IDAL PORTION OF CHARLES RIVER AT NORTH WASHINGTON STREET BRIDGE

(Concentrations in mg/l unless noted)

ameter	Average	Minimum	Maximum
H units)	7.75	7.7	7.9
ended Solids	20.5	18.0	24.0
l & Grease	1.1	0.6	1.6
al Kjeldahl Nitrogen	1.025	0.64	1.5
onia Nitrogen	0.19	0.07	0.26
fate	2,483.75	1,950.0	3,325.0
al Phosphorus	0.15	0.06	0.24
cific Conductance (μmhos/cm)	36,500.0	34,000.0	39,000.0
al Coliform/100 ml	1,012.5	450	1,800.0
al Coliform/100 ml	94	20	300
oride	9,850.0	4,400.0	14,000
enic	0.0035	0.001	0.0111
mium	0.025	0.02	0.03
omium	0.0425	0.03	0.06
per	0.098	0.02	0.24
d	0.0238	0.22	0.27
cury	0.00012	0.000	0.003
kel	0.155	0.13	0.20
ver	0.035	0.03	0.04
c	0.055	0.03	0.12
solved Oxygen			
urface (3 ft)	5.45	4.4	7.0
iddle (12-21 ft)	5.10	4.5	5.7
ottom (25-43 ft)	3.75	2.4	5.1

rce: Massachusetts Division of Water Pollution Control, 1982.

Table 24

SEDIMENT QUALITY
ABOVE NEW CHARLES RIVER DAM
(Concentrations in mg/kg dry weight unless noted)

Parameter	Average Concentration	Minimum	Maximum
Grain Size Curve/Fine (%)	43.00	7.00	75.00
Solids (%)	63.48	43.21	74.98
Volatile Solids-EPA (%)	7.12	2.62	15.72
Volatile Solids-NED (%)	5.51	1.19	13.51
Total Kjeldahl Nitrogen	1,700.0	400.0	4,200.0
Oil & Grease (%)	10.5	0.06	31.4
Mercury	1.24	0.4	2.84
Lead	472.77	58.4	1,024.7
Zinc	468.57	95.4	1,189.4
Cadmium	7.43	1.1	20.1
Chromium	60.0	15.1	140.0
Copper	194.6	60.5	449.2

Source: COE GE-3, KE-3, KE-4. Collected and analyzed in 1972.

Table 25

SEDIMENT QUALITY
BELOW NEW CHARLES RIVER DAM
(Concentrations in mg/kg dry weight unless noted)

Parameter	Average Concentration	Minimum	Maximum
n Size Curve/Fine (%)	71.00	64.0	78.00
ids (%)	40.535	31.51	49.56
atile Solids-EPA (%)	11.65	8.18	15.71
atile Solids-NED (%)	10.01	6.5	13.52
al Kjeldahl Nitrogen	3,350.0	1,800.0	4,900.0
& Grease (%)	2.0	0.8	3.1
ercury	2.34	1.59	3.09
ead	705.35	465.6	945.1
ic	880.5	416.6	1,344.4
amium	9.35	4.1	14.6
romium	241.0	69.4	412.6
pper	534.0	369.2	698.8

urce: COE GE-4, KE-7. Collected and analyzed in 1972.

comparable.

Sediments

Upstream of the new Charles River Dam, the average quality of surface sediments, presented in Table 24, indicates predominant Category 2 to Category 3 quality. The maximum sediment concentrations are highly contaminated and clearly of Category 3 quality. Minimum sediment concentrations were all in Category 1. Downstream of the new dam, the minimum, maximum, and average sediment concentrations were predominantly of Category 3 quality (see Table 25). Metals present in the highest concentrations were lead, mercury, zinc, and copper. While stratified testing was not conducted, it is reasonable to assume that sediment quality improves with depth such that at depths possibly below 4 feet, Category 1-2 conditions are present.

Marine Life

A warm water fishery is present upstream of the new Charles River Dam. The Massachusetts Division of Fisheries and Wildlife conducted a fishery survey near the Boston University Bridge during July 1981. In order of abundance, the fish found in the sampling included golden shiner, white perch, alewife, pumpkinseed, yellow perch, white sucker, white catfish, northern pike, chain pickerel, and brown bullhead. Growth rate was reported to be excellent and the condition factor was comparable to the state-wide average. Some of these species are also likely to be found between the new and old dams. Anadromous fish that pass into the Charles River include smelt, herring, and alewives.

3.7.4 Industrial Water Use

A survey of industrial seawater users in the Fort Point Channel and portions of the Inner Harbor was conducted to determine whether these users would be adversely affected during construction of the proposed project or have their use of seawater restricted as a result of the prese of the tunnel. Seawater users adjacent to the tunnel alignments a shown in Table 26.

3.8 WETLANDS

3.8.1 Description of Existing Conditions

Federal and Massachusetts agencies with regulatory authority over wetlands define such areas in different terms. According to the U.S. Army Corps of Engineers (COE), federally-regulated wetlands are defined as:

> ". . . areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

Based on the definition of wetlands adopted by the COE and on field observations, no Federally regulated wetlands occur in the project area.

Under the Commonwealth of Massachusetts Wetlands Protection project area wetlands are consider coastal wetlands. Such areas incorporate the land under the Cha River and Boston Inner Harbor, including Fort Point Channel, as w as lands up to the limit of spring tides, and areas generally inundat by a 100-year storm event.

Figure 25 delineates the 100-year floodplain and the maximu extent of wetlands in the project governed by the Massachusetts Wetl Protection Act.

3.8.2 Evaluation of Project Area Wetlands

As no Federally regulated wetlands occur in the project area and State regulated wetlands prima constitute various types of develo

Table 26

SALTWATER USE IN BOSTON HARBOR

Name	Location	Primary Use	Maximum Daily Use (mgd)*
.llette Company	Gillette Park South Boston	Cooling	39.0**
ethlehem Steel	265 Marginal Way East Boston	Cooling	0.28
assport	Fish Pier South Boston	Washdown	0.43
ames Hook & Co.	15 Northern Ave. South Boston	Lobster Support	5.0
ay State Lobster	379 Commercial St. Boston	Lobster Support	4.32
ines and Smart	33 Mill Street East Boston	Lobster Support	3.60
arbor Lobster	Fish Pier South Boston	Lobster Support	1.44
aul's Lobster	150 Northern Ave. South Boston	Lobster Support	1.44
eptune Lobster	88 Sleeper St. South Boston	Lobster Support	1.00
ankee Lobster	272 Northern Ave. South Boston	Lobster Support	0.86
ew England Aquarium	Central Wharf Boston	Marine Aquarium	0.15

*Millions of gallons per day.

**Based on National Pollutant Discharge Elimination System permit; actual capacity is 57.6 mgd.

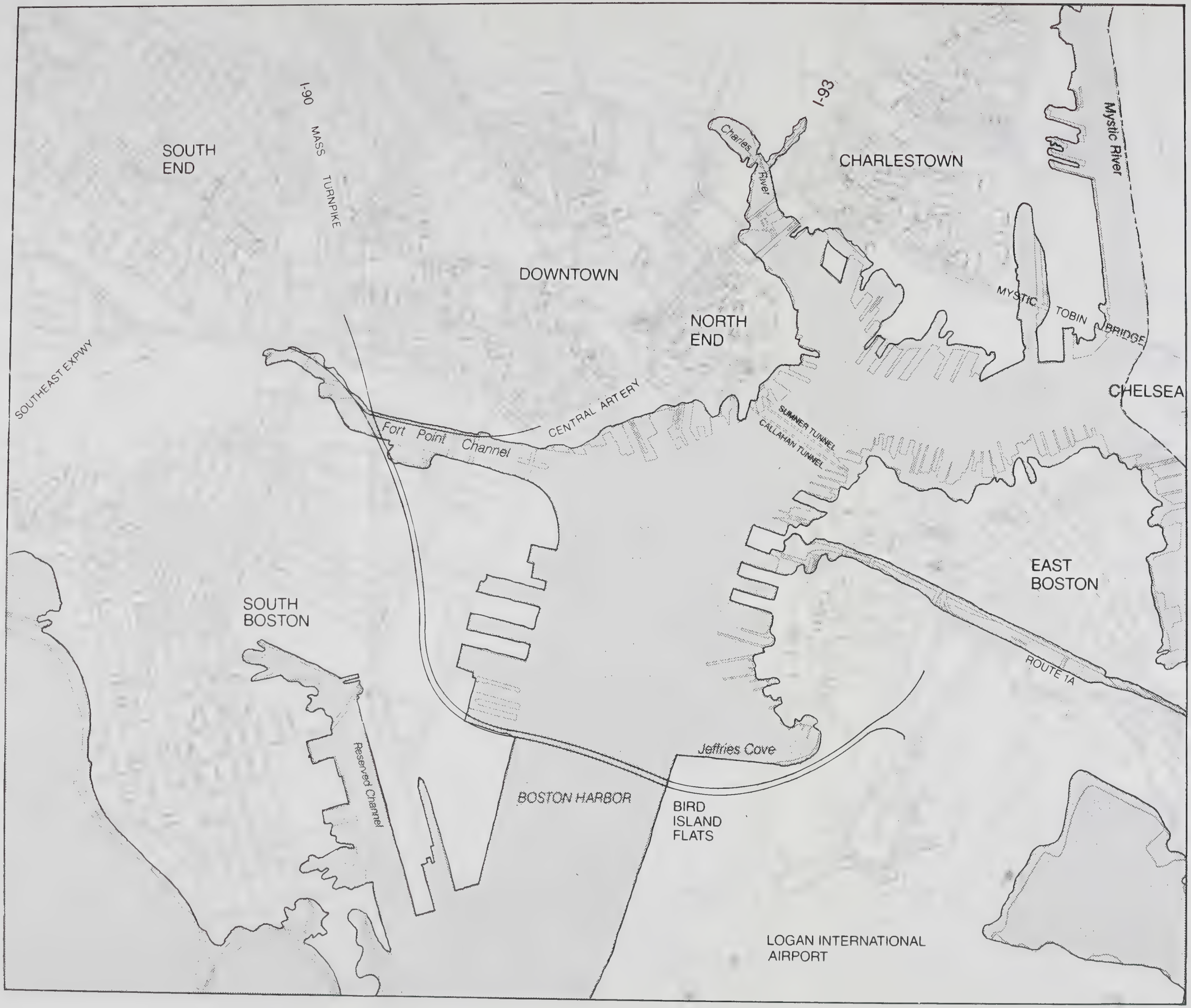


Figure 25
100 Year Flood Zone

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Cen

nd uses, water resources, oodplains, and upland vegetative mmunities, evaluations of these sources are addressed in Sections 2 LAND USE, 3.7 WATER RESOURCES, 3.9 OODPLAINS, and 3.10 VEGETATION AND LDLIFE of this FEIS/FEIR.

.9 FLOODPLAINS

The extent of the 100-year lood zone is illustrated in Figure 5. The project will involve filling ortions of the Fort Point Channel. his construction will involve onversion of open water areas to ighway tunnel or depressed, open oadway. Construction of new bridges ver the Charles River and tunnel ramp onnections from Leverett Circle will lso affect floodplains in the area. mpacts from changes in these areas re discussed in Section 4.11 LOODPLAINS of this report.

According to the Federal mergency Management Agency (FEMA), he Charles River and the Fort Point hannel are not regulatory floodways.

.10 VEGETATION AND WILDLIFE

.10.1 Vegetation

Due to the urbanized character of the project area, upland vegetative communities are limited, and consist of successional areas and open space. Successional areas refer to vegetated sites subject to eventual plant community replacement. These lands are primarily composed of disturbed sites, including vacant lots and areas adjacent to abandoned or infrequently used railroad corridors. Open space communities consist of maintained, landscaped sites, including recreational facilities.

Successional and open space sites occur in scattered locations and exhibit a relatively low diversity of plant species. The dominant plants in successional areas are herbaceous, including such species as ragweed, milkweed, clover, dandelion, plantain, and a variety of grasses. Some woody plant species are also present. Such species typically include tree-of-heaven, black cherry, and staghorn sumac, among others. Characteristic plant species of open space sites include sycamore, Norway maple, scarlet oak, lombardy poplar, gingko, clover, dandelion, plantain, and ragweed.

3.10.2 Wildlife

The wildlife habitat in the project area is quite limited. This limitation is a function of the scattered locations of the vegetative communities, as well as their relatively small size and proximity to highly developed areas.

Wildlife species observed during field investigations included herring gulls, pigeons, common grackles, starlings, blue jays, American robins, and house sparrows. Additional species, however, are also likely to occur in the project area.

3.10.3 Endangered and Threatened Species

Table 27 provides a list of Federally-listed endangered and threatened species for Massachusetts. Under Commonwealth regulations, only the Federally-listed species and the small whorled pogonia (a flowering plant) are protected as threatened or endangered species. According to the Massachusetts Division of Fisheries and Wildlife, the whitlow-wort (a flowering plant) is also being considered for listing in Massachusetts.

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service report that the occurrence of any of these species in the project area, including Boston Inner Harbor and the Charles River, is highly unlikely.

Although not officially protected by special status designation, a variety of vegetative and wildlife species have been identified as uncommon in Massachusetts. None of these species

Table 27

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

Common Name	Scientific Name	Status	Distribution
FISHES:			
Sturgeon, shortnose*	Acipenser brevirostrum	E	Connecticut River and Atlantic Coastal waters
REPTILES:			
Turtle, green*	Chelonia mydas	T	Oceanic straggler in Southern New England
Turtle, hawksbill*	Eretmochelys imbricata	E	Oceanic straggler in Southern New England
Turtle, leatherback*	Dermochelys coriacea	E	Oceanic summer resident
Turtle, loggerhead*	Caretta caretta	T	Oceanic summer resident
Turtle, Atlantic ridley*	Lepidochelys kempii	E	Oceanic summer resident
BIRDS:			
Curlew, Eskimo**	Numenius borealis	E	Alaska to Argentina, Southwest Pacific Ocean: New Caledonia
Eagle, Bald	Haliaeetus leucocephalus	E	Entire state
Falcon, American peregrine	Falco peregrinus anatum	E	Entire state - re-establishment to former breeding range in progress
Falcon, Arctic peregrine	Falco peregrinus tundrius	E	Entire state-Migratory - no nesting
MAMMALS:			
Bat, Indiana**	Myotis sodalis	E	Eastern & midwestern USA
Cougar, eastern	Felis concolor cougar	E	Entire state - may be extinct
Whale, blue*	Balaenoptera musculus	E	Oceanic
Whale, finback*	Balaenoptera physalus	E	Oceanic
Whale, humpback*	Megaptera novaeangliae	E	Oceanic
Whale, right*	Eubalaena spp. (all species)	E	Oceanic
Whale, sei*	Balaenoptera borealis	E	Oceanic
Whale, sperm*	Physeter catodon	E	Oceanic
MOLLUSKS:			
None			
PLANTS:			
Pogonia, small whorled	Isotria medeoloides	Proposed	East and Mid-Western USA
Whitlow-wort (Silverling)	Paronychia argyrocoma albimontana	Proposed	Maine, Massachusetts, New Hampshire

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

** These species are not specifically listed as present in Massachusetts by the U.S. Fish and Wildlife Service. Their inclusion in this list is based on the Massachusetts Division of Fisheries and Wildlife, 1979 Massachusetts Species for Special Consideration. Fauna of Massachusetts, Series No. 5

Source: U.S. Fish and Wildlife Service, 1980 and 1982.

was recorded during field investigations. Additionally, based on their habitat requirements, none of these species is likely to occur in the project area.

3.11 HISTORIC AND ARCHAEOLOGICAL RESOURCES

3.11.1 Historic Resources

This section identifies the historic sites within the project area which are either listed, eligible or potentially eligible for listing on the National Register of Historic Places. These sites have been identified through an intensive field inventory and a literature review undertaken as part of this study. The findings of this effort are documented in two separate reports "Historical Resources Inventory", prepared in December 1982 and June 1983 as part of the DEIS/DEIR and SDEIS/SDEIR and have been discussed with the Massachusetts Historical Commission and the Boston Landmarks Commission. Consultations with these agencies was a basis for judging the potential eligibility of resources in the project area.

Historic Resources in Downtown Boston

The Central Artery corridor runs through the heart of downtown Boston, an area which has seen 350 years of building activity. Within this area lie numerous historic districts and many more individual buildings either on or potentially eligible for the National Register of Historic Places. In addition, some of the individual buildings are National Historic Landmarks or Boston Landmarks. The following designations are used next to several of the resources:

(NR): listed on the National Register of Historic Places, which includes properties of local, state, or national significance designated by the U.S. Department of Interior through the State Historic Preservation Officer.

(NHL): designated a National Historic Landmark, properties of outstanding national significance designated directly by the U.S. Department of Interior.

(BL): designated a Boston Landmark.

All other buildings included here either have been determined to be eligible for the National Register, or are considered potentially eligible either individually or as part of a district, based on consultations with the Massachusetts Historical Commission and the Boston Landmarks Commission. The numbered resources are located on Figure 26.

Historic Districts West of the Central Artery

The following districts, which lie in whole or in part within the area of potential impact to the west of the Central Artery, are listed and described briefly below.

1. Charles River Basin District (NR)

The Charles River Basin is the keystone of the metropolitan park system in Boston. The park reservations along the edge of the Basin, established in the 19th century, still provide the well-utilized recreational space that was envisioned when they were planned. The Charles River Basin National Register District incorporates the Basin and the parkways and landscaped areas on both banks for approximately six miles upstream from the old Charles River Dam to the Eliot Bridge; the District also includes Storrow Drive and Leverett Circle. The Dam, the canals, the seven bridges that cross the Charles and the numerous structures in this district display a range of architectural style and civil engineering accomplishment that reflect the evolving technology of the past one hundred years. Significant buildings and structures within the district and in the vicinity of Leverett Circle are the Charles River Dam, 1903-1910; the MBTA Green Line

Legend

1 Charles River Basin District (NR)
2 Bulfinch Triangle District
3 Blackstone Block District (NR)
4 Cornhill District
5 Exchange District
6 Custom House District (NR)
7 Commercial Palace District
8 Essex/Kingston Textile District
9 Chinatown District
10 Old West Church (NR, NHL)
11 First Harrison Gray Otis House (NHL)
12 Boston City Hall
13 Faneuil Hall (NR)
14 Faneuil Hall Market (NR)
15 Old State House (NR, NHL)
16 Carter Winthrop Building (NR)
17 (Former) Federal Reserve Bank (BL)
18 272–276 Franklin Street
19 Richardson Block Buildings
20 United Shoe Machinery Corporation (NR)
21 Causeway – North Washington Streets District
22 North End District
23 Old Waterfront District
24 Fulton – Commercial Streets District (NR)
25 Long Wharf District (NR)
26 Leather District
27 Russia Wharf (NR)
28 South Station Headhouse (NR)
29 Fort Point Channel District
30 Commonwealth Pier (NR)
31 Fish Pier
32 South End National Register District
33 Albany Street Area
34 Butler Aviation Hangar
35 Streetcar Tunnel

NR – Listed on the National Register of Historic Places
NHL – Designated a National Historic Landmark
BL – Designated a Boston Landmark

Figure 26
Historic Resources in the Project A

0 550 1100 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Centr

Legend
● Historic Property
— Historic District

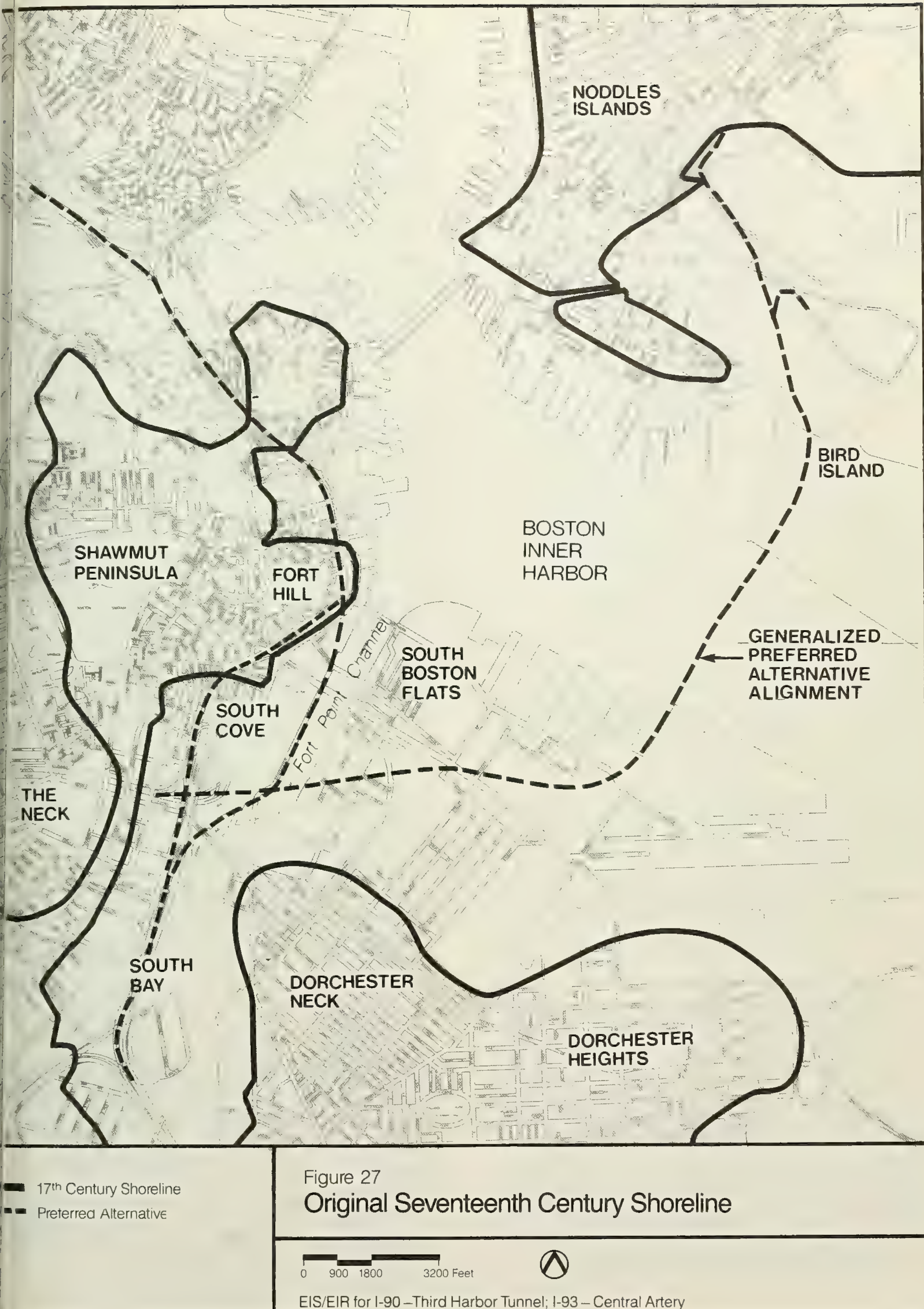


Figure 27
Original Seventeenth Century Shoreline

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Viaduct, 1910; and the Metropolitan District Commission Police Headquarters and Lock Houses, 1910.

2. Bulfinch Triangle District

Bounded by Causeway, Canal and Merrimac Streets, this district includes approximately half the triangular street pattern which architect Charles Bulfinch laid out for the area now commonly known as North Station. The architecture of the area is diverse, with the most distinctive structures generally four to six-story late 19th century brick warehouses in the Richardsonian Romanesque and Victorian Commercial styles.

3. Blackstone Block District (NR)

The buildings within this block, bounded by Union, Hanover, Blackstone and North Streets, are a sampler of 18th, 19th, and 20th century building types unified by their modest scale and general use of brick. The alleys which meander through the interior of the block date from the 17th and early 18th centuries and have been designated a Boston Landmark. Along the Blackstone Street edge is the last remaining vestige of the pushcart market called "Haymarket". Significant buildings within this district which lie within the project corridor include Union Oyster House, 41-43 Union Street, c. 1714 (NR); and Hancock House, 10 Marshall Street, c. 1767-1776 (NR, BL).

4. Cornhill District

This grouping of diverse architectural elements is centered at the intersection of Court and Tremont Streets and includes fine examples of the Italianate, Romanesque and Federal Revival styles, several designed by well-known architects. Significant buildings within this district which lie within the project corridor include the Sears Block, 65 Cornhill Street, 1848; Sears Crescent, Cornhill Street, 1816, remodelled c. 1860; and the Ames Building, 1 Court Street, 1887-1889 (NR).

5. Exchange District

The Exchange District is the historic center of the City's regional commerce, banking and insurance industries. The area is characterized by early skyscrapers in the classical tradition, averaging eight to ten stories in height and generally constructed of light-colored materials such as limestone, granite and tan brick. A significant building within this district which lies within the project corridor is the National Shawmut Bank, 20-42 Water Street, 1906

6. Custom House District (NR)

The Custom House District, centered around Broad and India Streets, is significant as one of the city's first examples of urban planning. Under the direction of architect Charles Bulfinch, the once dilapidated wharf area was redeveloped in the early 19th century into an area of wide streets and Federal-style warehouses, a number of which survive today. Also located here are several monumental structures associated with Boston's maritime and commercial history, as well as a number of fine late 19th and early 20th century masonry buildings.

Significant buildings within this district which lie within the project corridor include the Batterymarch Building, 54-68 Batterymarch Street, 1927 (NR); the Board of Trade Building, 2-22 Broad Street, 1901 (NR); Bulfinch Warehouses, nine buildings at 5, 7-9, 64-66, 68-70, 72-72A, and 102 Broad Street; 171, 173-175 Milk Street; and 25-27 India Street, 1805-07 (NR); 50-54 Broad Street, c. 1863 (NR); State Street Block, McKinley Square, 1858 (NR); United States Custom House, McKinley Square, 1837-47 and 1913-1915 (NR); Central Wharf, 146-176 Milk Street, 1816 (NR); Chadwick Lead Works, two buildings, 172-174 and 176-184 High Street, 1875 and 1887 (NR); Flour and Grain Exchange/Chamber of Commerce Building, 177 Milk Street, 1890-92 (NR); and the Richards Building, 112-116 State Street, c.

1859 (NR).

7. Commercial Palace District

This district is located along Franklin, Arch, Devonshire, Summer and Bedford Streets. It includes "Church Green", the historic name for both the intersection of Bedford and Summer Streets and the polygonal Neo-Grec granite commercial building which occupies the site.

Two-thirds of the buildings in the area date from the years immediately after the Great Fire of 1872, when the city was quickly rebuilt with 4- to 6-story masonry commercial buildings in the Italianate, Neo-Grec and Panel Brick styles. Contemporary newspaper accounts called them "the new palaces of Boston merchants", and they typify the stylistic variety and fine craftsmanship of the late 19th century. Significant buildings which lie within the project area include the Church Green Buildings, two buildings, 101-103 and 105-113 Summer Street, 1873-74 (BL); the Bedford Building, 89-103 Bedford Street, 1874-76 (NR); and the Proctor Building, 100-106 Bedford Street, 1896-97 (BL).

8. Essex/Kingston Textile District

Centered at the Essex/Kingston intersection, this ensemble of high-quality late 19th century brick manufacturing and wholesale houses is associated historically with the city's textile trade.

9. Chinatown District

The area centered around Beach and Kneeland Streets and the small streets which cross them is the center of the fourth largest Chinese community in the United States. Begun with the settlement of Ping On Alley over a century ago, the area was firmly established as Chinatown by 1890, although most of its population growth has occurred since the Chinese Revolution in 1949, and the continuing influx of new residents has kept Chinese language and customs strong.

The area, developed from tidal flats beginning in the 1830s, is characterized by tiny, crowded streets and a mix of small-scale 19th century row houses and commercial buildings and larger early 20th century industrial buildings, the latter especially where the district overlaps with the Textile District. Onto this traditional Boston streetscape has been grafted a colorful overlay of Chinese signs and fanciful Chinese restaurant architecture, which gives the district a distinctive quality. It includes the Chinese Merchants Association Building, 20 Hudson Street, 1949, judged potentially eligible for the National Register despite its date, and St. James Church, 125 Harrison Avenue, c. 1900.

Individual Historic Buildings West of the Central Artery

10. Old West Church, 131 Cambridge Street, 1806 (NR, NHL)

This structure exemplifies the architectural principles set forth by its designer, Asher Benjamin, in his book, The American Builder's Companion (1806).

11. First Harrison Gray Otis House, 141 Cambridge Street, 1796 (NR, NHL)

The first of three houses in Boston designed by Charles Bulfinch for Otis, a prominent lawyer, member of Congress and mayor of Boston.

12. Boston City Hall, One City Hall Plaza, 1961-68

Designed by Kallman, McKinnell, and Knowles, this is one of the most significant Boston buildings of the 20th century; its architectural significance makes it potentially eligible for the National Register despite its date.

13. Faneuil Hall, Faneuil Hall Square, 1740-42 (NR, NHL)

A rare example of Early Georgian public architecture sensitively enlarged by Charles Bulfinch during the Federal period and focal point of pre-Revolutionary War protest.

14. Faneuil Hall Market, three buildings, 100-300 Faneuil Hall Marketplace, including the "Quincy Market" and North and South Market Buildings, 1824-26 (NR, NHL)

Designed by Alexander Parris, these are Boston's finest remaining examples of early Greek Revival style. Also the oldest surviving trabeated granite buildings in Boston, the buildings incorporate numerous innovative construction techniques.

15. Old State House, 208 Washington Street, 1712-13 (NR, NHL)

The oldest extant public building of Georgian design in the United States, it was the center of political activity in Massachusetts during Colonial and Revolutionary War periods.

16. Carter/Winthrop Building, 276-278 Washington Street, 1893 (NR)

This building is a fine example of the Second Renaissance Revival style and is technologically significant as the first steel frame skyscraper in Boston.

17. (Former) Federal Reserve Bank, 22-24 Pearl Street, 1922 (BL)

The culmination of Boston's classically-derived commercial architecture, this structure is among the last and most literal interpretations of the Renaissance Revival style in downtown Boston. It was the first permanent New England home of the Federal Reserve Bank.

18. 272-276 Franklin Street, 1877

A nearly intact example of the early Queen Anne style, now rare in the Central Business District.

19. Richardson Block Buildings, 113-115 Pearl Street, 1873 and 1885

A group of rare, marble-faced, post-fire buildings which form the only Neo-Grec commercial block remaining in the Financial District.

20. United Shoe Machinery Corporation, 34-66 High Street, 1928 (NR, BL)

An exceptionally fine Art Deco office building, it reflects Boston's contemporary setback legislation, which virtually doubled the height of the downtown Boston skyline.

Historic Districts East of the Central Artery

21. Causeway-North Washington Streets District

This is a district of late 19th to early 20th century brick industrial buildings ranging in height from five to nine stories. The portion of the district south of Causeway Street was originally part of the Bulfinch Triangle but is now separated from the remainder of this street pattern by the Central Artery and MBTA Green Line viaduct. The buildings were constructed for a variety of mercantile and manufacturing purposes. Several share common detailing.

22. North End District

The North End is Boston's oldest extant residential neighborhood. Settled in the 1630s, it housed a cross-section of Bostonians, rich and poor, many associated with maritime activities on the neighboring waterfront. In the 19th century, it housed the successive waves of immigrants that poured into Boston. Presently, it remains as a largely Italian neighborhood.

Its narrow streets, many of them little changed from the earliest

da..., are crowded with architectural ev...ence from every period of its hi...ory.

Significant properties within th... district which lie within the pr...ect corridor include Copps's Hill Bu...al Ground, Charter, Snowhill and Hu... Streets, 1660 (NR); St. Stephen's Ch...rch, Hanover Street, 1804 (NR); the Pa... Revere House, 19 North Square, 16...); renovated 1908 (NR, NHL); the Pi...rce-Hichborn House, 29 North Sq...are, 1680-1710, (NR, NHL); and Ch...ist Church (Old North), 191 Salem St...eet, 1723 (NR, NHL).

23. Old Waterfront District

The area of Boston waterfront th... stretches between Commercial Wh...rf South and Lincoln Wharf was an im...ortant center of Boston's maritime de...elopment in the mid-19th century. Be...ween 1830 and 1880, wealth from the o...rseas trade and new building te...hnologies, especially in the ha...dling of granite, combined to p...duce one of the world's most i...ressive waterfronts of that era. I... 1868, in an attempt to integrate ... transportation needs into that w...erfront to keep it competitive with o...er ports, broad Atlantic Avenue was e...ended straight through the area and j...ned to Commercial Street, cutting C...mercial Wharf in two pieces.

From Commercial Wharf south, m...h of the area has been radically c...nged by developments such as the C...tral Artery, Harbor Towers and the W...erfront Park; however, while some a...rition has taken place in the form o... demolition and modernization, the m...ssive wharf buildings still dominate a...d give clear historical form to the a...ea.

Significant buildings within t...is district which lie within the p...oject corridor include Lewis Wharf, ...-32 Atlantic Avenue, 1836-38; C...mmercial Wharf North, 65-69 Atlantic A...enue, 1894; Commercial Wharf South, ...-85 Atlantic Avenue, 1832-1834; ...-77 Commercial Street, (now the W...arf Restaurant) 1888; Commercial Wharf, 1834; 220-254 Commercial Street, c. 1845-1870; Union Wharf, 1846-47 (NR); Lincoln Wharf, 365 Commercial Street, 1907; and Pilot House, 38-50 Eastern Avenue, 1863.

24. Fulton-Commercial Streets District (NR)

The Fulton-Commercial Streets District, one of the last remnants of Boston's 19th century waterfront, is a unique environment of commercial architecture of the 1830s to 1860s. The brick row units, originally four stories high, with granite posts and lintels at street level, constitute what is probably the most extensive grouping of this type of shop front now extant and are significant both for their extreme coherence and as the historical and physical setting for three major architectural works: Mercantile Wharf, 1857; Commercial Block, 142 Commercial Street, 1857; and the McLauthlin Building, 120-1/2 Fulton Street, c. 1864.

25. Long Wharf District (NR)

The original 800-foot Long Wharf (1710-1721) was for decades Boston's busiest pier. Extended to almost a half mile in length in 1740, the wharf was then substantially reconstructed in an expansion project completed in 1857. Filling gradually landlocked the wharf, and the last traces of the 18th century structure disappeared with the construction of Atlantic Avenue in 1868-1870.

Significant resources within the district are the Custom House Block, 1848; and the Gardiner Building, c. 1830.

26. Leather District

A homogeneous area of late 19th century commercial buildings related to Boston's important leather business; determined to be eligible for the National Register.

Individual Historic Buildings East of the Central Artery

27. Russia Wharf, 518-340 Atlantic Avenue, 270-272 & 278-288 Congress Street, 1897 (NR)

Fine intact trio of late 19th century commercial/industrial structures, all Classical Revival in style.

28. South Station Headhouse, 620-690 Atlantic Avenue, 1898 (NR)

This structure is significant as Boston's first monumental public example of the Neo-Classical Revival style; as a key element in the evolution of railroad station planning; and as a prototype for the double-decker track system.

Historic Resources in South Boston

29. Fort Point Channel District (1836 - 1930s) - potential National Register District.

The Fort Point Channel area, including the Channel itself, the bridges over it, and the wharves, warehouses and transportation facilities on either side of it, comprise a physical record of the complex transportation developments which necessarily accompanied the rapid industrial expansion of Boston in the late nineteenth and early twentieth centuries, and is a symbolic vestige of the original Shawmut Peninsula. It is potentially eligible for the National Register. FHWA and the Massachusetts Historical Commission have agreed that the Congress Street, Summer Street and Old Colony Railroad Bridges are also potentially eligible for the National Register (see letters dated October 13, 1982 and June 30, 1983 in COMMENTS AND COORDINATION).

The district includes the following contributing elements.

a. The Fort Point Channel (c. 1890s).

Historic waterway bordered by granite bulkheads, created as part of late - 19th century industrial/ transportation development of South Boston.

b. The Northern Avenue Bridge (1908).

Pivotal lift swing bridge; it has been determined eligible for the National Register.

c. Congress Street Bridge (1930).

Single-leaf bascule bridge; it represents the final period of development of the Channel and warehouse subdistrict.

d. Summer Street Bridge (1898).

A retractible bridge, a design developed in Boston; although inoperable it, is one of only two remaining such bridges in the city.

e. Old Colony Railroad Bridge (1899).

A Scherzer rolling lift bridge, perhaps the most important of South Boston's many bridges.

f. Boston Wharf Co. Warehouse District (1880 - 1930).

A unified district of late 19th and early 20th century industrial buildings built by the Boston Wharf Co.

g. Factory Buildings Trust/A Street Industrial Buildings

Extension of the Boston Wharf Company industrial development; industrial buildings dating from 1890s - 1930s.

Individual Historic Buildings in South Boston

30. Commonwealth Pier, 1914 (NR)

The South Boston Flats were developed in the early years of the 20th century as part of a vigorous campaign for the enlargement of Boston's port. The development included the new Fish Pier, built in

1914 to house the Boston Fish Market, the Commonwealth Pier, and other physical improvements to the surrounding area. Following its completion, the Commonwealth Pier became the center of the American wool trade, as well as a port of entry for immigrants to the United States serving the Hamburg-American Line, which brought immigrants to Boston from Germany and intermediate European ports. The pier is impressive in its architecture, and includes a four-story head house, one of the few remaining major public Beaux-Arts structures in the City. The viaduct connection to Summer Street is an early example of the separation of roadway, railroad, and shipping modes of transportation. Viaduct Street is functionally part of Commonwealth Pier, but is neither structurally nor architecturally integral to the pier. Viaduct Street is constructed in a standard roadway design. Also, Viaduct Street is not individually eligible for the National Register. Because Commonwealth Pier is an eligible building, not the center of an eligible district, Viaduct Street is not a contributing feature of an eligible district.

31. Fish Pier (1914-1915)

Adjacent to Commonwealth Pier and part of the development of the South Boston Flats described above, the pier is an architecturally unified complex of three, three-story buildings made of brick with terra cotta classical ornamentation. It is still in its original use as the center of Boston's commercial fishing industry.

South End/South Cove Area

Little above-ground physical evidence of early development remains in the area which may be affected by the project. Further to the west is the South End National Register District and a proposed Boston Landmark District. At the edge of these districts one small group of 19th century warehouses remains. The following historical resources in the area have been identified and are also presented on Figure 26.

32. The South End National Register District (19th century).

A district of Victorian bow-front row houses; it is the largest residential National Register district in the U.S.

33. Albany Street Area (1880s and 1890s) - a potential National Register district.

An area of several long, five-story brick and granite warehouses representing the industrial development of the Albany Street warehousing area in the last decades of the 19th century.

Historic Resources in East Boston

34. Butler Aviation Hangar (1930s). Logan Airport.

The original Eastern Airlines Hangar; one of the earliest buildings at the Airport.

35. Streetcar Tunnel (1904, electrified 1924). MBTA Blue Line tunnel from Boston to Maverick Square, East Boston.

This tunnel is the second oldest underwater vehicular tunnel in North America.

3.11.2 Archaeological Resources

A Phase I, Step 1 Archaeological Survey was undertaken for this project. The reconnaissance level survey focused on the South Bay, South Cove, Fort Point Channel and Fort Hill areas of Boston; and the Conrail railroad right-of-way in East Boston and parts of Logan Airport. The survey indicated a high probability of significant historic archaeological resources being located in all of these areas, including evidence of remains of rope walks, remains of maritime trade and wharves, and refuse from industrial and institutional development. It also

indicated that prehistoric sites are likely to be located in the South Bay/South Cove and East Boston railroad right-of-way areas, yielding relevant climatological, geological, floral, and paleontological data and providing information on past human subsistence practices and settlement patterns. Figure 27 presents the outline of the original 17th century shoreline and its relation to the Preferred Alternative.

The survey also covered the Central Artery and South Boston corridors. In the Central Artery corridor, between Dewey Square and the Causeway Street area of Boston, prehistoric and historic archaeological sites are likely to exist within the original land mass. These sites would cover several time periods and functional or cultural affiliations, since this area is one of the most significant archaeological zones in the greater Boston area. In the South Boston corridor, prehistoric archaeological sites inundated after their occupation by rising sea levels and subsequently filled may also be found. The remains of prehistoric sites may also be preserved within the bounds of South Boston's original land surface. Historic archaeological resources of possible significance are primarily 19th and 20th century, owing to the more recent development of this area in comparison to nearby areas of South Boston and Boston. Remnants of the out wharves, buried footings from the Atlantic Avenue elevated railway, vestiges of the 18th century timber wharves and piles, and possibly stone seawalls may be encountered. Remnants of the former Mill Creek may also be encountered.

The results of the Phase I, Step 1 survey report have been reviewed by the Massachusetts Historical Commission, the State Historic Preservation Officer and the Boston Landmarks Commission; a Phase I Step 2/Phase II survey to locate and assess the significance of archaeological sites will be performed consistent with the Memorandum of Agreement (see COMMENTS AND COORDINATION).

3.12 UTILITIES

The project area includes a maze of publicly- and privately-owne utilities. Types of utilities encountered include storm drains, sanitary sewers, combined sewers, water mains, gas mains, telephone ar power lines, fuel lines, steam lines fire alarm and police communication systems, etc. The utilities listed below are keyed to Figure 28.

1. East Side Interceptor, 32-inc x 54-inch combined sewer (CS located in Atlantic Avenue.

2. 72-inch CS from Purchase Str t to Oliver Street, crossing t Central Artery and Atlantic Avenue to Fort Point Channel near Hook's Lobster.

3. Fort Point Channel outfalls Dorchester Avenue: at Congre Street, 36-inch x 36-inch CS at Summer Street, 60-inch CS from Kneeland Street, 81-inc x 81-inch CS.

4. 60-inch CS outfall to Fort Point Channel at Dorchester Avenue Bridge.

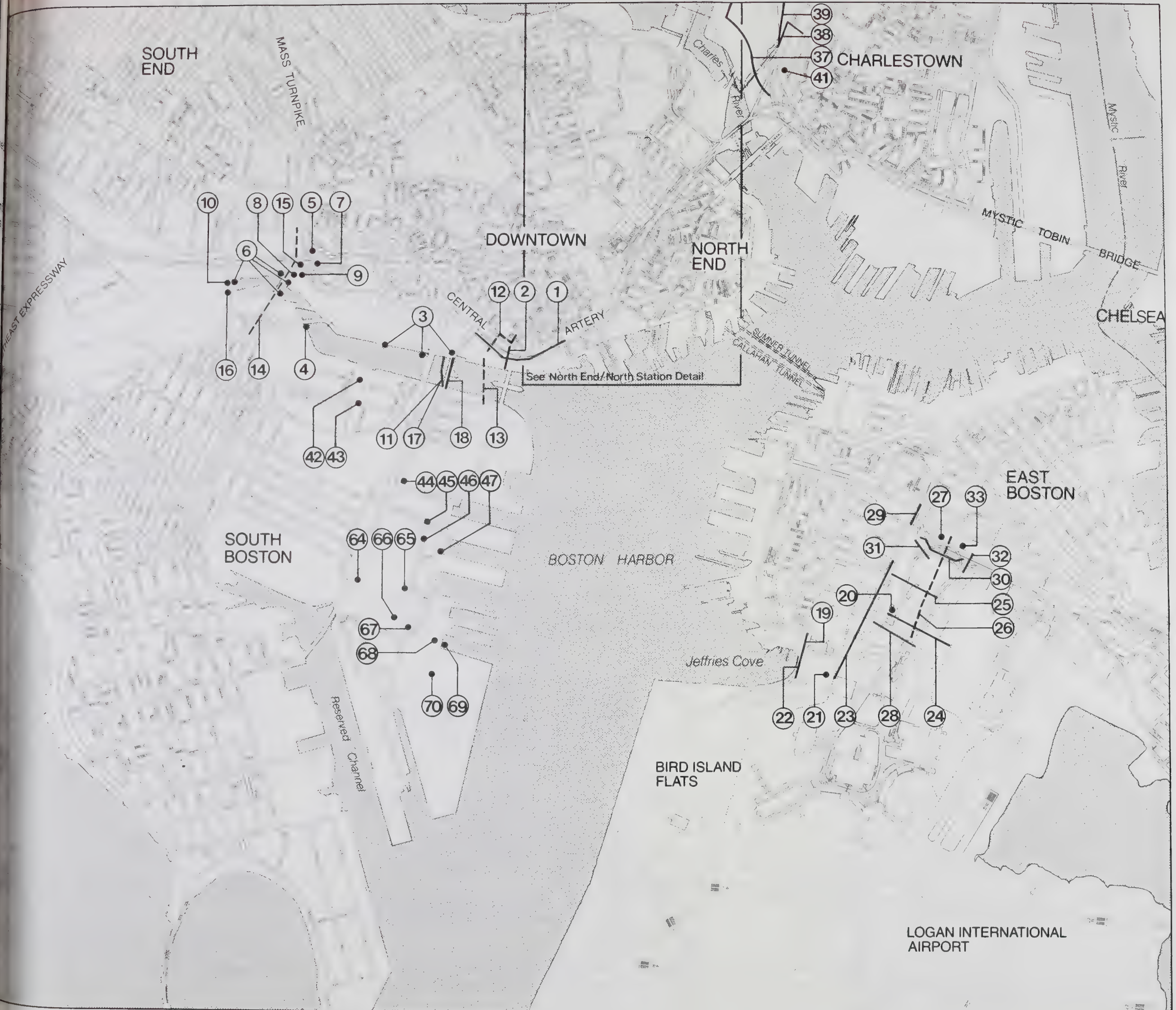
5. Massachusetts Turnpike Authority (MTA) pump house #

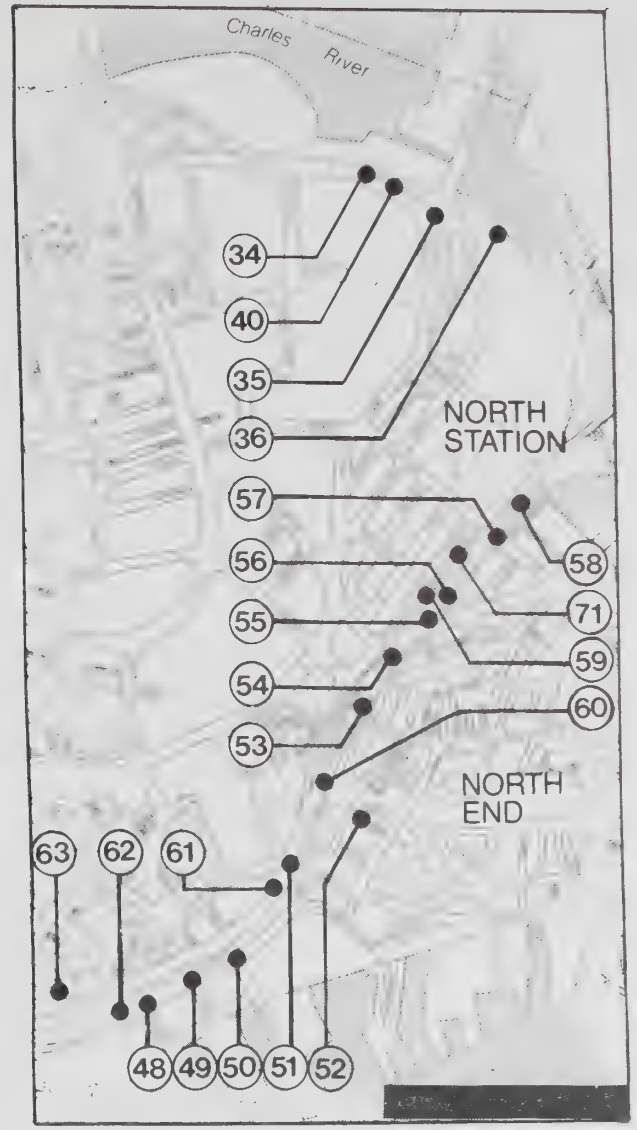
6. South Bay outfalls: 72-inch at Albany Street near Travel Street, 36-inch and 8-inch force mains from MTA pump hose #7, 48-inch CS near West Fou h Street, two 10-inch discharg pipes from MBTA pump house a Tidal Drain Reservoir.

7. East Side Interceptor in the vicinity of the railroad yars and crossing under the Turnp e ramps, 32-inch x 54-inch CS.

8. Railroad Tidal Drain Reservo in railroad yard adjacent to Broadway.

9. MBTA pump house at Tidal Dran





NORTH END/NORTH STATION

Figure 28
Major Existing Utilities

0 450 900 1800 Feet

EIS/EIR for I-90, The Third Harbor Tunnel

Reservoir.

10. Roxbury Canal Conduit outfall, twin 20-foot x 15.5-foot pipes.

11. Boston Edison utility tunnel crossing Fort Point Channel between Congress Street and Summer Street.

12. 115,000 volt electric lines at Purchase Street and Oliver Street crossing Central Artery to Boston Edison sub-station near Harbor Plaza Building.

13. 115,000 volt electric lines from Boston Edison sub-station, crossing Fort Point Channel to South Boston near Northern Avenue.

14. 115,000 volt lines from Harrison Avenue suspended on Broadway Bridge crossing to South Boston at Dorchester Avenue.

15. 30-inch Intermediate Pressure gas pipe crossing area of Turnpike ramps and railroad yard from Kneeland Street to Albany Street.

16. 24-inch Intermediate Pressure gas pipe crossing West Fourth Street from Albany Street to the Gillette Company.

17. Telephone submarine cable between Congress Street and Summer Street crossing Fort Point Channel from Dorchester Avenue and Sleeper Street in South Boston.

18. 16-inch and 24-inch water mains crossing Fort Point Channel from Dorchester Avenue at Congress Street to Northern Avenue in South Boston.

19. 60-inch storm drain adjacent to Bird Island Flats (BIF) access road.

20. Telephone and electric duct banks servicing several airport locations.

21. 8-inch sanitary sewer force main in BIF access road.

22. 20-inch water line in BIF access road.

23. 12-foot x 10-foot Porter Street combined sewer outfall.

24. 20-inch water line in vicinity of East Boston Athletic Field.

25. 7-foot 10-inch x 8-foot 2-inch storm drain in vicinity of East Boston Athletic Field.

26. 24-inch sanitary sewer in vicinity of MBTA Airport Station.

27. 6-foot 6-inch x 4-foot 4-inch railroad drain in vicinity of MBTA Airport Station.

28. 60-inch storm drain in vicinity of Emery Air Freight Building.

29. 6-foot x 6-foot 4-inch combined sewer in Porter Street in vicinity of railroad crossing and Orleans Street.

30. 24-inch water line crossing Airport access and egress roadways, near MBTA Airport Station.

31. 12-inch gas line crossing Airport access and egress roadways near MBTA Airport Station.

32. 36-inch storm drain crossing Route 1A and Airport egress roadways.

33. Railroad drainage storage box near MBTA Station.

34. 36-inch combined sewer (CS) siphon under Charles Street.

35. Twin 48-inch CS siphon exiting into 39-inch x 39-inch CS at Leverett Circle.

Lowell Street weir structure with 48-inch and 54-inch CS exiting pipes; Charles River CS junction chamber and 84-inch inlet and outlet pipe to MDC Chlorination and Pumping Facility.

96-inch Charles River Marginal Conduit CS Interceptor from MDC Detention Chlorination Pumping Station.

72-inch storm drain from Rutherford Avenue to Millers River.

54-inch storm drain from Interstate Route 93 to Millers River.

Two major telephone services (Boston-Cambridge A Cable); one with twelve, 3.5-inch conduits and one with twelve, 3-inch conduits.

36-inch water main.

72-inch storm drain along Mt. Washington Avenue to Fort Point Channel.

In this area of A Street: 54-inch storm drain; 24-inch sanitary sewer; sixteen, 4-inch New England Telephone Co. ducts; 20-inch water main; and a 12-inch high-service water main.

Boston Edison 115,000 volt electric lines.

16-inch high service water main.

30-inch water main.

In this area of Northern Avenue: 115,000 volt electric lines; 16-inch water main and a 16-inch high service water main.

66-inch combined sewer (East Side Interceptor); 16-inch steam main; 30-inch gas main.

66-inch sanitary sewer; 84-inch storm drain.

50. 24 telephone ducts.

51. 48-inch sanitary sewer; 60-inch storm drain; 66-inch combined sewer; 96-inch storm drain; 30-inch sanitary sewer; 30-inch storm drain; 24-inch water main.

52. 30-inch x 36-inch combined sewer; 66-inch combined sewer.

53. 48-inch x 54-inch combined sewer; 30-inch x 36-inch combined sewer; 24-inch water main; 20 telephone ducts.

54. 57-inch x 60-inch combined sewer; 30-inch water main; 20 telephone ducts.

55. 102-inch combined sewer; 30-inch x 36-inch combined sewer; 30-inch water main.

56. Two 60-inch combined sewers (inverted siphon under MBTA Orange Line); 36-inch combined sewer.

57. 32-inch x 60-inch combined sewer (West Side Interceptor), two 115,000 volt electric lines.

58. 36-inch water main and thirty-six, 4-inch telephone ducts in the vicinity of Beverly Street.

59. MDPW Pump House No. 1; electrical substation.

60. MDPW Pump House No. 2.

61. MDPW Pump House No. 4.

62. MDPW Electrical Substation.

63. MDPW Pump House No. 5.

64. Pump Station at Summer Street between 7th and 8th Streets.

65. 24-inch sanitary sewer from Northern Avenue and Trilling Way to Summer Street pump station.

66. Telephone/electric duct banks servicing local area.

67. 115,000-volt electric lines in Massport Haul Road.

68. General Ship Power Plant near Dry Dock No. 4 at C Street and 7th Street.

69. 42-inch drain outfall.

70. 42-inch drain in C Street from 5th Street to outfall.

71. MBTA substation at Haverhill Street, south of Traverse Street.

In addition to these public and private utilities, there is an extensive signalling, communications, and interlocking system for the Amtrak intercity rail facilities crossing the Fort Point Channel into the South Station terminal area.

A number of new utilities have also been proposed by others within the project area. These utilities are proposed for construction, subject to funding constraints. The following summarizes the proposed utility construction by others.

o Combined Sewer Overflow (CSO) Screening Facility off Causeway Street at the Charles River Estuary.

o 18-inch Massport sanitary sewer in Northern Avenue in the vicinity of Piers 5 and 6.

More information regarding the locations of these major utilities is contained in the <u>Supportive Engineering Report</u> for the FEIS/FEIR.

3.13 VISUAL CHARACTERISTICS

The South Bay, South Boston and Logan Airport portions of the project area are primarily (though not exclusively) located in industrial areas. The Central Artery project corridor encompasses most of downtown Boston and includes historically significant buildings and districts, and some of Boston's most visually distinctive neighborhoods.

This visual inventory highlights important visual characteristics of the project area.

3.13.1 South Bay

View from the Road

The area surrounding the Central Artery in the South Bay area is automobile and railroad-oriented or industrial in character. Neighborhoods lie beyond the highway and are remotely visible from the roadway. Immediately next to the highway, buildings are generally low, and are surrounded by large expanses of land used for parking, loading, and rail yards. The visual environment is very open and flat. Several industrial landmarks are located in the area: the Italianate tower of the Pine Street Inn in the South End, the triple smokestacks of the abandoned Boston incinerator, and the railroad bridge and open water of the remaining South Bay; however, it is unlikely that any of these landmarks have much significance to most motorists apart from their strong visual forms. Northbound motorists are afforded views of Boston's Financial District, particularly Dewey Square Tower which is the most prominent structure.

View of the Road/Pedestrian Environmen

There is little view of the road for pedestrians or other drivers because the road is surrounded by industrial uses. From the upper floors of several buildings the area appears to be open, flat and dominated by highways.

The best views of this area are obtained by rail passengers who ride through the area bound to or from South Station. From this vantage point the view is of tidal flats, the granite bulkhead of the back end of Fort Point Channel, and the historic railroad bridge spanning the Channel. These surviving elements from the active era of the Channel's history

a visual entry point to the City.

3.13.2 South Boston/Fort Point Channel

/ of the Road/Pedestrian Environment

The South Boston/Fort Point nnel area has four visually tinct districts within it:

The district of brick ehouses along the Fort Point nnel, A Street and Congress Street characterized by a grid street tern which establishes a sense of entation; a uniformity of building ght and materials; and urban street nities such as sidewalks and street hts which make the area relatively fortable for pedestrians. Views of ntown Boston link this area ually to the rest of the city.

The former Penn Central Rail ds, which lie to the east of the ehouse district, are now vacant or d for parking. Pedestrians or orists using this area lack a sense orientation or scale within this trict because of the expanse and lack of an established perimeter. Summer Street Bridge establishes point of orientation; however, ause there are no ground-level eets to which it can be compared, s one landmark gets lost in the rall environment. There are few tant views of recognizable dmarks from this area.

The area around Northern Avenue ms the northern edge of South ton, and there is a clear visual k between this area and downtown. thern Avenue is distinguished by intimate link with the Harbor. h pedestrians and drivers are aware the water, and the numerous er-related industries along thern Avenue reinforce this strong sociation. The facades and bulk of Commonwealth Pier and the Fish r are strong orientation elements ich form an edge to the street. ews of the Boston skyline as one is aded westbound along Northern Avenue impressive. When the new Northern Avenue Bridge is completed and the Avenue is realigned, a dramatic vista of downtown will be created for the full length of Northern Avenue.

o The area lying east of Viaduct Street, south of Northern Avenue and north of Summer Street is Commonwealth Flats, a Massport owned development area. Commonwealth Flats contains industrial buildings, surface parking lots and vacant parcels covered with scrub vegetation. The area affords distant views of the skyline and the Airport.

3.13.3 Fort Point Channel/Dewey Square

View from the Road

The area above the Central Artery and the Dewey Square tunnel is one of complicated circulation patterns and pedestrian-vehicle conflicts which demand the attention of both motorists and pedestrians. Nonetheless, several major landmarks are easily noticed: South Station, Federal Reserve Bank, and the Dewey Square Tower. Glimpses of the retail district and the Fort Point Channel can be seen in opposite directions along Summer Street, and the towers of the Financial District are visible beyond Dewey Square.

View of the Road/Pedestrian Environment

Pedestrians are confined to narrow corridors between the elevated Central Artery and the rows of buildings fronting on Atlantic Avenue and Purchase Street. There are also restricted views to the Channel along cross streets and vacant parcels.

The Fort Point Channel is visible to motorists or pedestrians crossing one of the three bridges in this area, but the most significant views are presented to abuttors and to the many tourist and lunchtime visitors to the Channel area.

The Channel's major visual aspects are its large water surface, its views to the Harbor and East Boston, and its maritime and historic

character represented by its bridges, anchored or berthed ships, and by the five- to nine-story masonry buildings which line much of its shoreline from Summer Street north. The Federal Reserve Bank, Stone and Webster Building, and South Postal Annex contrast in material and scale with the other buildings along the Channel.

3.13.4 Central Artery - Congress Street to High Street

View from the Road

As the northbound motorist emerges from the Dewey Square Tunnel and rises toward the elevated structure, the first views are of the roadway itself, followed by a dramatic view of the Harbor Towers buildings and Boston Harbor. Southbound motorists can look across the northbound lanes and see the Federal Reserve Building, the Dewey Square Tower, and the Fort Point Channel area. However, as the motorist approaches the Dewey Square Tunnel, the large number of merges and weaves require such concentrated attention that little notice can be given to such landmarks.

View of the Road

The Central Artery forms a major visual and physical barrier between the Financial District and the Fort Point Channel area. As the roadway emerges from the Dewey Square tunnel, it is first seen as a wide, depressed roadway and then becomes a wall as it rises to become an elevated roadway. In this section the width of the roadway and ramps causes it to appear as a vast open space which is unlike the pattern of the city, and increases its impact as a barrier.

Pedestrian Environment

Views toward the water from Pearl, Oliver and High Streets end abruptly at the Central Artery. A pedestrian moving along Atlantic Avenue or Purchase Street sees traffic and a concrete and steel wall. The orientation of buildings in the area is toward the streets perpendicular to the Central Artery, and the sidewalks which parallel the Central Artery are devoid of amenities or street level commercial activities. For pedestrians in this area, there is an overwhelming sense of being surrounded by vehicles, noise and fumes.

For pedestrians walking adjacent to the Central Artery, the curve of the structure combined with the ramps which cut off ground level views make it impossible to see around the road. Because of this, pedestrians cannot see their destinations and are easily confused about their location relative to city landmarks and streets.

3.13.5 Central Artery - High Street to Clinton Street

View from the Road

The Central Artery in this area curves around downtown Boston. The motorist has a dramatic view of a rich visual environment with clear views of the Custom House Tower, the Financial District skyline, Quincy Market, the Marriott Hotel, and Waterfront Park. There are distant views of the Bunker Hill monument, Old North Church, and the expanse of Boston Harbor.

The motorist gains a sense of orientation to the city and can see many destinations from the vantage point of the elevated roadway. This portion of the Central Artery provides both north and southbound motorists with an exciting visual experience of Boston, although concentration on the roadway is required because of the geometry.

View of the Road

There are no on- and off-ramps in this part of the Central Artery; it is therefore narrower than in other areas, and does not present impassable barriers to either views or movement. Visual impacts are largely dependent on the vantage point of the viewer. Views directly perpendicular to the

Artery (e.g. from Quincy Market, Milk Street and East India Row) are not particularly restricted by the Central Artery. Until the viewer is near the structure itself, it appears as a band across the sky with buildings, ground plane and sky visible both above and below it.

From those streets which intersect at an acute angle to the structure (e.g. Broad Street, India Street), views are considerably more restricted and the steel structure takes up a much greater percent of the horizon. The BRA has established a visual easement from Broad Street under the Central Artery and across Rowes/Fosters Wharf to the Harbor.

There are office buildings located very close to the western side of the Artery. Views of the Central Artery from adjacent office buildings, particularly from the lower levels, are generally unattractive because of the elevated structure and the heavy traffic on the Artery.

Pedestrian Environment

As pedestrians approach the Central Artery and either pass under it or walk parallel to it, the full effect of the structure is felt. The area below the Central Artery structure is dark and the columns which seem quite slender from a distance are large enough to make circulation difficult. Noise and vibration from traffic are acute. Heavy pedestrian traffic crosses under the Central Artery along the "Walk-to-the-Sea" connecting Quincy Market to the Waterfront, and the BRA has established this corridor as a visual easement and a key location for upgrading the pedestrian environment.

3.13.6 Central Artery - Clinton Street to North Washington Street

View from the Road

From this portion of the Central Artery, the views for the motorist are similar to those noted above, although there are closer views of the North End and tall buildings are further away. The city seems more distant as it is viewed across a wide expanse of roadway structure owing to exit and entrance ramps in the area. This is particularly true for northbound motorists, whose view does not include many tall buildings as distant landmarks.

View of the Road

The Central Artery is a major visual and physical barrier disrupting the sight lines and creating an awkward street pattern in this area. The ramps to and from the Artery form walls that are largely impenetrable between the North End and Government Center. Because of this barrier affect, the BRA has established a formal visual easement which spans the Central Artery in this area, and has established design guidelines requiring that the sight line from City Hall Plaza to the steeple of Old North Church be maintained.

Pedestrian Environment

Pedestrian access across the Central Artery corridor is very difficult in this area. Heavy traffic and an awkward street pattern inhibit easy access between the North End and the Haymarket MBTA Station. A pedestrian underpass beneath the Central Artery connects the two ends of Hanover Street. The surface roadway system which serves the Central Artery is extremely hazardous for pedestrians, and is essentially impassable in the Callahan/Sumner Tunnel plaza area.

The width and low height of the viaduct in this area creates a dark and unpleasant street level environment. The structure vibrates with overhead traffic and magnifies its noise. Automotive exhaust fumes below the viaduct aggravate an unpleasant environment.

Two- to four-story brick buildings in the North End are within ten yards of the viaduct and are dwarfed by it in the vicinity of

Stillman Street. On the western side of Cross Street, the Central Artery forms a "building wall" which is in scale with the buildings lining the east side of the street. This encloses the space and creates a feeling of intimacy, compatible with the North End street scale.

The historic Blackstone Block and the outdoor market located on Blackstone Street have, as a backdrop, a ramp from the Central Artery and the viaduct above it. Traffic from the Callahan Tunnel entrance backs up on this ramp causing noise and air pollution in this active pedestrian area. In the area of the Government Center Garage and BRA Parcel 7, there are wide open spaces which focus visual emphasis on the Central Artery structure. This area has little definition of pedestrian circulation routes.

3.13.7 Central Artery - North Washington Street to Interstate Route 93/Route 1 Merge

View from the Road

This portion of the Central Artery rises to cross the Charles River and splits into a multi-level structure. The height of the bridge affords the motorist views across Charlestown, Boston and Boston Harbor. However, the bulk of the structure and the placement of the railings diminishes the views from an automobile. The extremely hazardous driving conditions on this portion of the Central Artery require such complete attention to other vehicles on the road that these vistas are barely noticed.

Southbound motorists, approaching Boston on a lower level roadway, see the bridge structure. There is no visual gateway into Boston until the motorist reaches the vicinity of Causeway Street, where the roadway is on a single level. Here the motorist's sight is directly on the Custom House Tower, providing a dramatic entry point to the city.

View of the Road

Views of the road in this ar[ea] vary as a viewer's vantage point shifts. In the area of the Bulfinc[h] Triangle, the Central Artery passes adjacent to very large buildings on the east and to the elevated MBTA Green Line and smaller buildings on the west. These facilities block views of the Central Artery except where streets cross through the tightly built pattern. The Central Artery is always present to occupan[ts] of the buildings which it abuts.

The Central Artery, as it crosses Causeway Street, is a massi[ve] steel structure which blocks views down the length of the street and visually divides the city in this area. The predominance of transportation facilities around No[rth] Station overwhelms the character of the streets. Views toward North Station from the Haymarket area are virtually blocked by the Central Artery structure.

Pedestrian Environment

From the vicinity of the parking lots behind North Station a[nd] the MDC's new Charles River Dam, th[e] Central Artery takes on a different aspect. In this area the bottom of the viaduct is 30-40 feet above ground, and the structure does not interfere with ground level circulation.

The pedestrian walking under the Central Artery from Causeway Street to the Charles River is overwhelmed by the mass of the structure and vehicle noise. This disagreeable character causes the Charles River Dam and the river's e[dge] to be an invisible part of the city and hides an interesting and attractive urban waterfront. Dista[nt] views of the Central Artery and Interstate Route 93 across the Char[les] River are almost graceful, and the river's granite bulkheads are visib[le] on both banks of the River. The Charles River Dam is landscaped and the combination of the dam, the MBT[A]

rolling-lift railroad bridge, the Central Artery's granite piers and sculptural trusses and K-braces, and the curve of the road in the distance form a visually interesting urban industrial environment.

3.13.8 Storrow Drive Ramps

The two-level ramps which connect Storrow Drive and Leverett Circle to the Central Artery wind between the West End and North Station areas and cross over the MBTA's commuter rail tracks and platforms.

View from the Road

Because of the narrow curves and steep grades on these ramps, views for the motorist are primarily of the roadway itself. Connections from the Central Artery to Storrow Drive are on the lower level ramp and little is visible outside of the structure. Motorists on the upper level ramps can glimpse buildings in the Charles River Park complex and the Boston Garden.

View of the Road/Pedestrian Environment

Views of the road in this area are perhaps more disrupted than in any other area of the city. As the ramps rise from Leverett Circle, they form an impenetrable wall, both visually and physically. This portion of Boston is very confusing to motorists and pedestrians alike, due primarily to the fact that the roadway structure bisects the area. As the ramps curve behind North Station, they are lost to view from most well travelled streets, thus diminishing their visual intrusion.

The area lying between the Storrow Drive ramps and the Charles River is one of the largest undeveloped areas in the city; it is also one of the least visible portions of Boston. The vast expanse of parking lots and the lack of clear circulation paths make the area very inaccessible to pedestrians, thus diminishing accessibility to the River and its interesting surroundings.

3.13.9 Logan Airport

View from the Road

Views from where the project will join the existing airport roadway system are of the airport's expanse of large scale structures, parking areas, and roadways. Most structures are one- to two-stories in height; exceptions are the Eastern Airlines hangar, Hilton Hotel, parking garage and control tower. Pedestrian activity is almost absent outside the termimal buildings, and views of airport structures are dominant.

View of the Road/Pedestrian Environment

The project area is bordered on the east by the shoreline of Bird Island Flats, currently being developed by Massport as a major mixed-use development with a wall of commercial buildings forming a visual and noise buffer along the edge of the airport, and a linear passive recreation park along Jeffries Cove. Along the west side of the Cove is Porzio Park, a neighborhood playground; several wooden piers; a variety of small- to medium-scale residential and industrial buildings; the massive structures of the Bethlehem Steel shipyard; and the row houses of the Jeffries Point neighborhood on rising ground beyond. The water surface of the Cove, anchored boats, and outstanding views of Boston and South Boston are major visual amenities. The Cove is rather narrow at its head, and views change significantly with changes in vantage point. Pedestrian activity is expected to increase following completion of the Bird Island Flats project.

4.1 DESCRIPTION OF CONSTRUCTION

This section describes construction methods and sequencing for the Preferred Alternative. Sequencing is also presented for redecking operations on the Central Artery (No-Build Alternative), for comparison of construction-period impacts. It also describes assumptions regarding the maintenance of existing utilities and traffic during construction. The effects of the proposed construction, based on these methods and assumptions, are discussed in the appropriate sections of this Chapter.

4.1.1 Construction Methods

The Preferred Alternative contains several major elements requiring different construction methods.

Sunken-tube construction is proposed for the harbor crossing itself. Prefabricated concrete or steel sections, approximately 500 feet long and approximately 88 to 98 feet wide, will be towed to the site by barge, sunk into a trench previously dredged in the harbor bottom, joined underwater, and covered with backfill. Fabrication of the tunnel sections will be done off-site. During preparation of the DEIS/DEIR, several potential concrete tube fabrication sites were investigated, including the proposed Lynn Marina Industrial Park area in the Port of Lynn, Massachusetts; the New London Mills area on the Thames River in New London, Connecticut; and the United Steel Buildings area on the Mill River in New Haven, Connecticut.

Because it is possible to fabricate steel sunken-tube sections in shipyards and tow them (with six to nine feet of draft) long distances, the steel tube manufacturing site is rarely located near the job site, but simply depends upon where the manufacturer is located.

Several possible steel tube manufacturers and fabricating sites are: Wiley Manufacturing, Port Deposit, Maryland; General Dynamics Corporation, Quincy Massachusetts; Bethlehem Steel, Sparrows Point, Maryland; Newport News Shipbuilding, Newport News, Virginia; Sun Shipbuilding and Drydock, Chester, Pennsylvania; and Chicago Bridge and Iron, Pascagoula, Mississippi.

A detailed study of the concrete and steel sunken tubes was performed as part of this study. Independent cost estimates of the two tunnel types indicated the costs are approximately equal (within five percent). Additional environmental analysis and necessary documentation on the impacts of the fabrication site will be performed before the tunnel material is selected (during the design phase).

Cut-and-cover tunnel construction is necessary on land and in the Fort Point Channel, where sunken tube construction is not feasible. Various types of cut-and-cover construction will be used.

In Fort Point Channel, steel sheet piles (or "sheeting") will first be driven to enclose the construction site. Within the barrier of sheeting two methods of construction will be adopted:

A. Central Artery northbound, from South Postal Annex to a point approximately 400 feet south of the MBTA Red Line (Sta. 83+00 to 94+00).

Within the barrier of sheeting at the south end of the Fort Point Channel where the cut-and-cover tunnel is deepest, temporary fill will be placed between the sheeting and the existing bulkhead of the Fort Point Channel. Slurry walls will then be constructed through the temporary fill to a specified depth below the tunnel bottom and the temporary fill material between the walls will be excavated.

al removed from the site. Silt and oer channel bottom materials will be eavated and tentatively carried away b barge for ocean disposal. The tnel, ventilation building and a new b.khead will then be constructed; the eavation will be backfilled to the o.ginal channel bottom elevation; and t sheeting and exterior slurry wall a)ve the channel bottom will be rnoved.

e Central Artery northbound, near t northerly end of the Fort Point Cannel beyond the MBTA Red Line (a. 94+00 to 105+00).

Within the barrier of sheeting a the north end of the Fort Point Cannel, where the cut-and-cover tnnel is shallowest, water will be pmped out; silt and other materials ill be excavated from the Channel bttom and tentatively carried away by rge for ocean disposal; the tunnel ad ventilation building and a new lkhead will be constructed; the cavation will be backfilled; and the eeting will be removed.

At the Airport, the construcon method will involve sheeting, cavation and dewatering within the eeted area; construction of the nnel and ventilation building; ckfilling; and restoring the origi-l ground surface (paving, etc.).

In many areas, tunnel sidewalls ll be constructed using the slurry ll method. This method has been oposed because it can be accom-ished in a narrow construction area, us minimizing disruption. In this thod, the proposed tunnel walls are ecisely excavated with special enching machinery, and the deep ench excavation is temporarily ipported by filling it with a water/ ay mixture called bentonite (or slurry"). Reinforced concrete walls e then poured in place while the lurry is pumped out and removed from ie site. The material between the alls is then excavated, bottom and pp concrete slabs are constructed, nd the tunnel is finally backfilled.

4.1.2 Construction Sequencing

No-Build Alternative

The following is a discussion of possible construction sequencing for redecking the Central Artery if the No-Build Alternative is implemented. The estimated time of construction required to redeck the Central Artery is three years.

The deck would be replaced using three construction crews. Two crews would work on the Central Artery starting at the midpoint of the construction, with one crew moving north and the other south. The third crew would work on deck replacement for the ramps. The existing deck would be cut and removed in large pieces, to be lowered into trucks below the viaduct (on the Surface Artery or in the existing parking lots) for transport to a disposal site(s). Precast concrete deck panels would be installed rather than being cast-in-place to minimize construction-period disruption.

Between the Dewey Square Tunnel and Causeway Street, the construction could take place one lane at a time, keeping six reduced width (approximately 11 feet wide) lanes available for normal traffic. Eight sequences would be required to redeck the total width of the Central Artery.

Redecking the portion of the Central Artery north of Causeway Street would require different sequencing. If the deck for each level were to be replaced while providing three lanes for traffic, the temporary lanes would be nine feet wide, which is below the minimum acceptable lane width of ten feet. For this portion of the Central Artery, therefore, the redecking for each level would be done in three phases, closing one lane to traffic and keeping only two lanes open in each direction.

During construction, all ramps would be kept open for traffic, although during the actual redecking

of the ramp, the useable lane width would be reduced to approximatey 11 feet.

Preferred Alternative

Approximately 12 years will be required for construction of this alternative. Assuming construction is commenced in late-1986, the availability of adequate Federal funding and ideal conditions (i.e., no material shortages, labor strikes, etc.), the overall project would be expected to be completed in approximately late-1997 or early-1998.

Although the total construction period is approximately 12 years, not all areas will be affected or disrupted during this 12-year period. The length of time that each area is affected during construction is as follows: South Bay Area - 4 years, then no construction for approximately 4 years, followed by 2-1/2 years of construction for connection to the contra-flow bus lanes; Central Area - 12 years; Area north of Causeway Street - 7 1/2 years; South Boston Area - 3 1/2 years; Boston Harbor - 3 1/2 years; Logan Airport Area - 3 1/2 years.

An extensive evaluation of the construction sequences associated with this alternative is documented in the Supportive Engineering Report of this FEIS/FEIR. In order to minimize the disruptive effects of construction in any particular area, construction contracts will be prepared which require completion of specific segments of the contract within a single construction season or less (i.e., although a particular contract may involve several years of work, certain portions of that contract will be required to be completed within a specified time frame). These completed segments of the project may subsequently be used to carry traffic while other facilities are closed to traffic.

Third Harbor Tunnel

Construction of the Third Harbor Tunnel tube sections off-si will require a three- to four-year construction period, primarily for fabrication of the tunnel sections Actual placement of the tunnel sec tions in the harbor will require approximately one month per sectio and one day for sinking. Approximately 9 tunnel sections are requi for the Third Harbor Tunnel.

Dredging activities in Bost Harbor will be performed using the clam shell method. Hydraulic dred methods were analyzed and rejected because of the following reasons: substantial dewatering requirement requirement for a spoils area with containment dike; need for a treat area for 490,000 cubic yards of dredged material; disruptions on navigation and shipping; required increased depth of excavation; and potential for increased environmen impacts and costs compared to clam shell dredging. Recreational boat activities as well as commercial navigation requirements in the Har have also been considered in devel ing the construction sequencing fo this alternative.

Underwater excavation for t sunken tube will require some bedr removal near Boston Marine Industr Park in South Boston. To remove t rock, controlled underwater blasti techniques will be used.

Depressed Central Artery

Stage construction for the depressed Central Artery tunnel wi proceed as follows, (see Figure 29

1. Existing Condition

The existing elevated struc is supported on steel bents set on concrete footings and piles. The Surface Artery is located beneath elevated structure.

2. Slurry Wall - Slurry Piles Transverse Grade Beam-Surfa Decking

The slurry walls will be

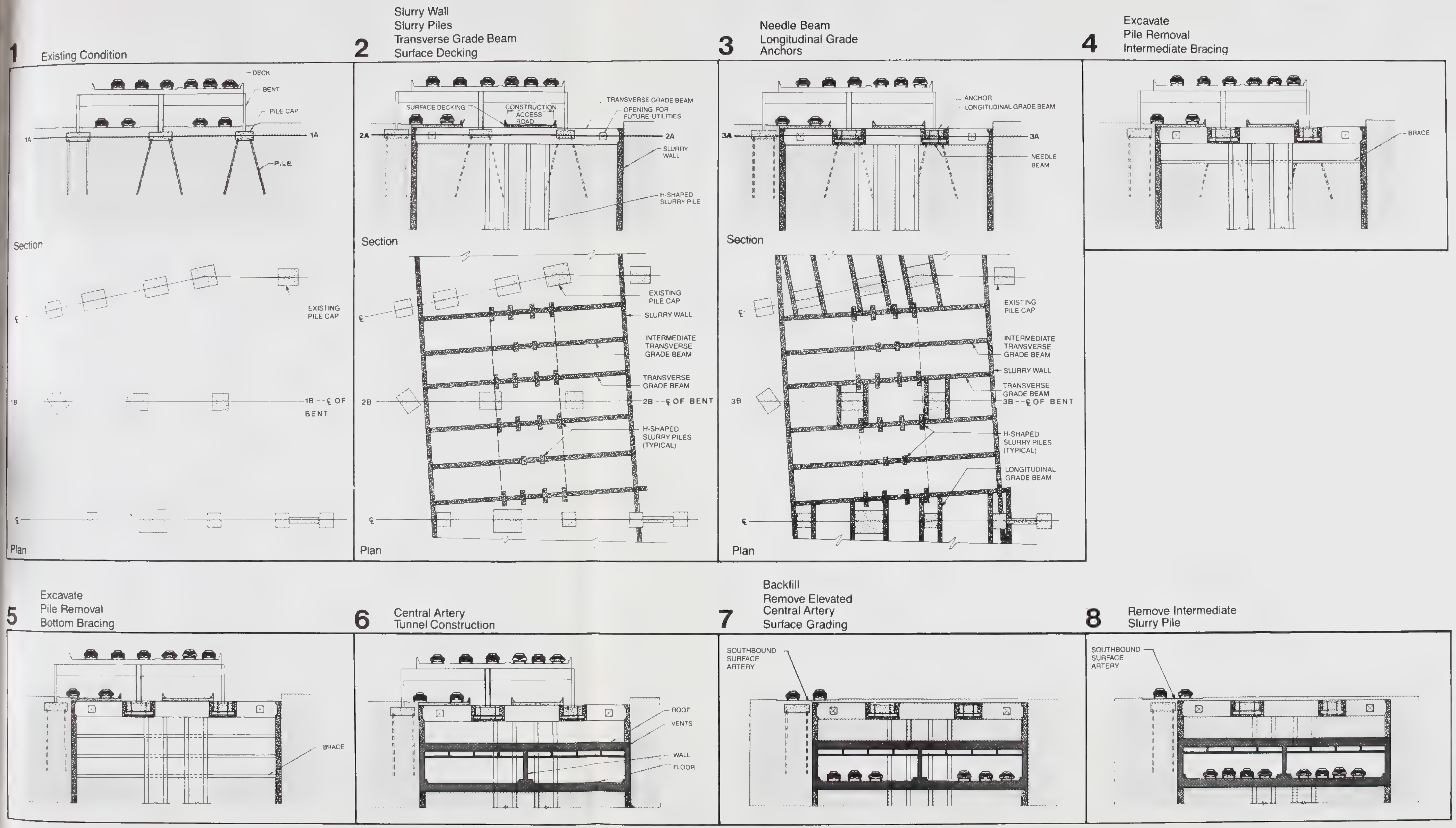


Figure 29
Depressed Central Artery–
Stage Construction, Typical

0 15 30

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

constructed and extended below the lowest excavation required for the depressed Central Artery tunnel box. A series of concrete beams (transverse grade beams) will be installed flush with the ground surface in a grid pattern surrounding the column footings. These beams will support the elevated structure and the top of the slurry walls. Each grade beam will also be supported by two H-shaped concrete slurry piles between the slurry walls. These piles will be formed by concrete walls installed by slurry trench methods. The piles will have sufficient cross-sectional area and column stiffness such that they will not require lateral bracing as the excavation proceeds. Surface decking will be provided under the existing elevated Central Artery to maintain both public and construction traffic. The surface decking will be supported on the transverse grade beams.

3. <u>Needle Beam - Longitudinal Grade Beam - Anchors</u>

Steel beams (needle beams) will be placed beneath the footings and joined to the concrete grid, to provide support for the columns holding up the Central Artery.

4.-5. <u>Excavate - Pile Removal - Bracing</u>

As excavation proceeds below the grade beams, multiple levels of steel cross bracing will be installed. The existing Central Artery piles will then be removed.

6. <u>Central Artery Construction</u>

All elements of the depressed Central Artery will be built with the intermediate slurry pile supports in place. The intermediate supports will be spaced such that two 40-foot wide (minimum) roadways can be temporarily maintained in the tunnel.

7. <u>Backfill - Remove Elevated Artery - Surface Grading</u>

After appropriate connections are made at each end of the depressed Central Artery tunnel, six lanes of through traffic from the Central Artery viaduct will be placed in the six temporary lanes of the depressed Artery tunnel. The top of the newly constructed tunnel will be backfilled, and the Central Artery viaduct removed.

8. <u>Remove Intermediate Slurry Pile</u>

After the intermediate slurry piles are removed, eight lanes of traffic can then use the depressed Central Artery tunnel.

4.1.3 <u>Maintenance of Traffic and Existing Utilities</u>

The Preferred Alternative will require temporary or permanent relocation of many utilities, and construction-period detours of traffic and rail services either to temporary structures or parallel routes. The lengths of such detours and the amount of time any detour is in use will be minimized as much as possible.

The assumptions used in planning construction are as follows.

<u>General</u>

1. Construction in the South Bay, South Boston, Fort Point Channel, the Third Harbor Tunnel and Logan Airport areas will be completed prior to the start of construction on the connectors to/from the Sumner and Callahan Tunnels. Temporary connectors will be provided to the South Station Transportation Center to maintain bus service during the Central Area construction period.

2. The Central Artery northbound cut-and-cover tunnel in the Fort Point Channel will be available for construction traffic from the time it is completed to the time the depressed Central Artery is opened to general traffic.

3. Construction of the permanent bus lanes between the Southeast Expressway and the South Station Transportation Center can be completed

nly after the depressed Central rtery is opened to traffic.

. Construction of Interstate oute 93, both northbound and southound, in the area north of Causeway treet (including the two new Charles iver Bridges) will be timed so that ts completion will occur simultaneusly with the completion of the epressed Central Artery.

outh Bay Area

. The construction will be timed so that the completion of the Third Harbor Tunnel, Logan Airport, South Boston and South Bay areas construction will occur simultaneously.

. Ramps to the Central Artery and Massachusetts Turnpike will be maintained at all times.

7. Except for the new Northern Avenue Bridge, all of the bridges crossing the Fort Point Channel will be affected by tunnel construction.

3. A temporary railroad bridge will be built to maintain rail service during the construction period when the existing Wye Connector (presently under construction by the MBTA) is shut down.

9. Five tracks into South Station and two tracks across the Dorchester Branch railroad bridge over Fort Point Channel, serving MBTA commuter rail and Amtrak intercity rail services, will be provided at all times by use of temporary tracks.

10. The West Fourth Street Bridge, presently closed, will be reconstructed as a separate project prior to construction of the Preferred Alternative, and will remain open at all times.

11. The Herald Street Extension Bridge will accommodate the MBTA's needs, including possible commuter rail service or a reconfiguration of MBTA Red Line trackage, and will be constructed prior to removal of Broadway Bridge.

12. The Harbor Plaza Building will be underpinned, permitting businesses to remain during construction.

Central Area

13. During construction a minimum of six lanes for local surface traffic will be available at all times between High Street and North Street where eight lanes of surface roads are presently available. Parking along the Surface Artery and Atlantic Avenue will not be permitted during construction.

14. Under the existing viaduct (from High Street to Causeway Street), a 40-foot wide construction haul road will be provided for the Contractor's transport of construction materials.

15. Construction will be phased in such a manner to:

Maintain six lanes of traffic on the elevated Central Artery during the construction of the depressed Central Artery, including use of the High-Level Bridge.

Maintain six express lanes of traffic in the depressed Central Artery and on the new Charles River bridges, and reserve the elevated Central Artery as a collector-distributor road for local access. After local connections are made to the depressed Central Artery, remove traffic from the elevated Central Artery and then remove the elevated structure and the High-Level Bridge.

16. Connections between the existing elevated and proposed depressed Central Artery and the Sumner and Callahan Tunnels, Atlantic Avenue and Purchase Street will be maintained.

17. Service on the MBTA Blue Line at State Street and the Orange Line below Haverhill Street will be maintained.

Area North of Causeway Street

18. Completion of the separate Central Artery North Area Project,

including the connectors to the Mystic-Tobin Bridge, will precede the start of construction of the depressed Central Artery.

19. Three lanes of Interstate Route 93 (south of the Mystic-Tobin Bridge connection) and ramp access to the Mystic-Tobin Bridge and City Square will be maintained. Two lanes of Interstate Route 93 (north of the Mystic-Tobin Bridge connection) will be maintained.

20. The ramp connection from Interstate Route 93 southbound to Leverett Circle will be unavailable for approximately 3 months, and the ramp connection from Leverett Circle to Interstate Route 93 northbound will be unavailable for approximately one year. Detour routes across the old Charles River Dam and Gilmore Bridge, with appropriate traffic management controls, will be instituted to serve this traffic.

21. A minimum of two lanes through Leverett Circle will be maintained at all times.

22. During construction, ten commuter rail tracks will be maintained at North Station.

23. Service on the MBTA's Orange Line under Interstate Route 93 in Charlestown, and the MBTA's Green Line at Leverett Circle will be maintained.

24. Access through the MDC locks at the new Charles River Dam and navigation in the channel will be maintained.

South Boston

25. Railroad access (one track) to the Army Base will be maintained at all times during construction.

26. A minimum of four lanes on Summer Street will be maintained during construction by means of a temporary bridge.

27. Temporary detour routes will be constructed at A Street, B Street, and Northern Avenue.

28. Relocated Northern Avenue from "B" Street to Atlantic Avenue will be completed as a separate project prior to the start of the Third Harbor Tunnel construction.

Boston Harbor

29. Half of the 1200-foot wide shipping channel will remain open to navigation at all times, except as noted below. These activities must be coordinated with the Coast Guard Captain of the Port.

30. During the tunnel sinking operations (approximately one day per tube), the channel should be closed to navigation. Again, these activities must be coordinated with the Cost Guard Captain of the Port.

31. Dredging operations will be coordinated with general shipping activities and with the Coast Guard Captain of the Port in Boston.

East Boston

32. The same number of lanes that exist today on the Airport roadways will be maintained at all times.

33. Access to East Boston Memorial Stadium will be maintained at all times.

34. Access to Bird Island Flats (BIF), although disrupted during the entire construction phase, will be maintained by constructing temporary roads.

35. The existing number of lanes on the Route 1A ramps to and from the Airport will be maintained during construction, with temporary structures.

36. Aircraft access to the Eastern Airlines Terminal and Hangar will be maintained, even if constructing a temporary satellite terminal and relocating the taxiway are required. (Underpinning the existing building, and further alignment refinements, may render the temporary satellite terminal to be unnecessary.)

Service on the MBTA Blue Line . not be significantly interrupted.

.4 Materials Movement and Staging Areas

:rials Disposal

Disposal of dredged and avated materials from corresponding struction sites is discussed in tion 4.13 DREDGED AND EXCAVATED ERIAL DISPOSAL.

Use of local East Boston eets for construction activities l be restricted by construction cifications. In the South Bay a, truck access to the Turnpike and tral Artery will be via the sting Turnpike/Central Artery erchange, using the Broadway and t Fourth Street Bridges, Frontage d, and Albany Street. Construction icles could also use Dorchester nue in Boston (south of the South tal Annex).

Nearly 2 million cubic yards of y material excavated for the ressed Central Artery will also e to be disposed; a potential eficial use of this clay is for pping" of sanitary landfills, many which are found in Southeastern and e Cod, Massachusetts (see Section 3 DREDGED AND EXCAVATED MATERIAL POSAL).

In addition to these materials, oval of the Central Artery and the h-Level Bridge structures will also uire special considerations for posal. Based on conversations with eral local highway contractors, posal of the steel viaduct will e no difficulties because of its vage value; this steel can be rocessed and thus reused. Disposal the reinforced concrete deck of the tral Artery could be more diffi- lt. As discussed in this study, wever, it is proposed that the deck cut into panels rather than pul- rized; the panels can potentially be ed for shore protection or some er beneficial use (see Section 13).

Staging Areas

These areas would be used for purposes such as material stockpiling, equipment storage, parking, and contractor field offices. Locations cannot be specified in advance, but their use will be controlled by contract specifications to reduce impacts on adjacent properties. Potential staging areas include, but are not limited to, portions of the parking areas under the existing Central Artery viaduct, which are to be acquired as part of the project. Demolition of existing buildings (such as the Anelex, Charles River, and Hook Lobster buildings) will occur soon after tenants have been relocated to provide additional staging areas to the contractors.

4.1.5 Construction Effects and Mitigation Measures

Rodent Control

The construction activities are expected to affect the existing rodent population in the area, particularly during the excavation and utility relocation phase of the work. State-of-the-art construction management techniques used in other cities have been able to control this problem. These techniques will be implemented, and are briefly described below.

Extermination operations to be specified during construction shall be in accordance with the rules and regulations of the City of Boston and State Health Departments and will consist of two phases, "Blitz" and "Maintenance". The "Blitz" phase occurs prior to the start of construction and consists of applying toxic materials to all utility, drain, and sewer lines and manholes within the project area where rodents gather or may gather during the construction period. This operation usually will kill large portions of the rodent population before construction work begins.

The "Maintenance" phase consists of placing a toxic material

combined with a suitable bait in all suspected habitat areas twice a month for the duration of the construction period. This phase will rid the area of any remaining rodents and their carcasses, and will prevent any rodent migration to adjacent buildings.

Water Table Control

It is extremely important to limit groundwater drawdown outside excavations to minimize settlements as well as to protect the wood piles which support many of the adjacent buildings.

Slurry wall lateral support systems will be used where necessary to prevent "near surface" groundwater levels from falling below normal ranges. Since the lateral support systems will typically be constructed down to glacial till or clay, the potential exists for interruption of usual groundwater flow patterns. Consideration will be given to providing for flow of groundwater across the excavation width, through installation of groundwater equalizer pipes in the slurry walls. This will be necessary to prevent development of elevated water levels on any one side of the excavation.

Some locations along the construction will require wells to be drilled into the rock in order to stabilize water pressures. Further engineering studies will determine what type of action will be required, such as grouting of the rock and/or groundwater recharge techniques.

Observation wells, piezometers, and deep settlement points will be used to monitor water levels and pressures during construction. The key features of any groundwater level control and monitoring program are:

Criteria

During project design, criteria for minimum allowable water levels or maximum tolerable drawdown are established. These are safe levels which, if not exceeded, will avoid deterioration of wood piles, excessive settlements of compressible soils and other problems related to groundwater lowering. Water level criteria are written into the contract specifications, with the requirement that the Contractor take remedial action to restore water levels as necessary. Remedial action may include pumping water back into the ground ("recharging") or reducing the drawdown by cutting off inflow of groundwater to the excavation.

Instrumentation

Prior to the start of excavation, an instrumentation system is planned and installed. Instruments will measure the elevation of groundwater. Groundwater levels may be different in the various soil strata. The system will include various types of instruments designed to effectively monitor water levels in differing soil types.

Observation wells will be used to monitor the more pervious strata including fill, sands, glacial till and decomposed rock. The water level in the 1-1/4"± diameter well is measured by sounding.

Piezometers (hydraulic, pneumatic or electric type) are used to measure water levels in less pervious soils (organic silt, clay). Piezometers consist of a typically 1-inch diameter, 12-inch long sensor installed in a borehole, within the soil stratum to be monitored. The sensor generally provides for measurement of water pressure in the ground at the sensor level. Groundwater levels are then calculated from pressure data. Readings are made remotely, at ground surface, through wires or tubing extending up the borehole from the sensor to a manhole or roadway box at ground surface.

Instruments will be located near adjacent structures sensitive to groundwater level drawdown, near areas where possible drawdown is anticipated, and in other areas as necessary to measure water levels over the

al area of influence.

Instruments will be installed e construction to measure exist- 'ater levels. Thus, baseline data be obtained for comparison during ruction; areas where existing own is occurring may be identi- and tidal fluctuations, if any, be determined.

Data Collection and Evaluation

Water levels in the instruments be measured periodically during ruction, and following construc- until levels have stabilized. ngs will be typically made weekly may be increased or decreased iding on the construction activi- in progress.

Water levels will be graphical- esented on time plots to facili- review of the data and evaluation ends in fluctuations. Water ls are compared with the criteria ie contract documents to determine emedial action is required.

Corrective Action

If construction modifications required to correct excessive down, the wells and piezometers continue to be monitored to rmine that water levels have been ored or to identify if further dial action is necessary. Re- ge or groundwater curtain cutoff the more common types of correc- actions that would be used.

TRANSPORTATION

This section examines in detail 1990 and 2010 transportation cts of the Preferred Alternative, ompared to the No-Build Alterna- . This section has been organized r the following categories:

- Traffic Volumes
- Volume-to-Capacity Ratios
- Levels of Service/Operating Speeds
- Central Artery Bottlenecks and Congestion Points
- Issues Concerning Traffic Forecasts
- Vehicle Miles and Vehicle Hours Travelled
- Safety
- Other Transportation Facilities
- Construction Impacts
- Parking Impacts

The long-term (1990 and 2010) impacts of the No-Build Alternative with a redecked Central Artery, are identical to those of a Do-Nothing Alternative, because redecking must be undertaken if the Central Artery remains in its current alignment. Since redecking is required with the No-Build Alternative, but not the Preferred Alternative, both have significant construction impacts which are discussed below.

The Third Harbor Tunnel proposed to be constructed with the Preferred Alternative assumes a one-way (inbound) toll facility, consistent with the permanent one-way (inbound) toll system which now exists for the Mystic-Tobin Bridge and Callahan/Sumner Tunnels.

4.2.1 Comparison of Alternatives

Table 28 provides a summary comparison of the transportation effectiveness of all build alternatives considered during the DEIS/DEIR and SDEIS/SDEIR process. The various indices in Table 28 as well as the hazardous cargo, public transportation, and construction period impacts are highlighted below.

Regional Highway Network

No-Build Alternative

In 2010 with the No-Build Alternative, the roadway system serving downtown Boston, East Boston, and South Boston will carry higher traffic volumes, on the order of 5 to 30 percent more than 1982 volumes, depending on the particular roadway link.

The major links in the core area: Interstate Route 93,

Table 28

OVERALL COMPARISON OF ALTERNATIVES - LONG TERM TRANSPORTATION EFFECTIVENESS*

Comparison Index (Order of Effectiveness)

ALTERNATIVE	Reduction in wkdy. Congestion hrs.	Reduction of Central Artery Queues	Diff. Bet. No-Build Veh. Mi. Td. (mill/yr)	Person Hrs. Travelled Reduced (mill/yr)	2010 PM Peak Hour LOS A-D Operations: Links/Rmps. (% of Total)	2010 PM Peak Hour LOS A-D Operations: Intrsctns. (% of Total)	Accident Reduction (% less than (No-Build)
Preferred Alt.	1	1	1 (-105)	1 (20.6)	1 (68)	1 (71)	3 (27)
No-Build Alt.	9	9	5 (0)	9 (0)	9 (35)	9 (43)	9 (0)
Alt. 2	7	8	7 (+19)	7 (5.7)	7 (57)	5 (62)	5 (23)
Alt. 3	6	7	6 (+19)	6 (5.7)	6 (57)	4 (62)	4 (23)
Alt. 3A	3	2	3 (-41)	3 (11.7)	3 (65)	7 (53)	1 (30)
Alt. 4	5	6	9 (+27)	5 (9.2)	5 (65)	3 (62)	7 (20)
Alt. 5	4	5	8 (+27)	4 (9.2)	4 (65)	2 (62)	6 (20)
Alt. 5A	2	3	4 (-39)	2 (14.8)	2 (65)	6 (55)	2 (28)
Alt. 6	8	4	2 (-59)	8 (2.7)	8 (52)	8 (49)	8 (15)

* Excludes Construction Period, Hazardous Cargo, Public Transportation, and Impacts on Other Transportation Facilities.

Mystic-Tobin Bridge, Central Artery north, Callahan/Sumner Tunnels, Central Artery south, the Massachusetts Turnpike, and Southeast Expressway will see a substantial increase in hours of congested operation; where these roadways are congested for 1 to 8 hours per day in 1982, congested operations will last from 5 to 14 hours per day in 2010 with the No- Build Alternative, with 14 hours of congestion occurring within the Callahan/Sumner Tunnels and on the northbound Central Artery south of the existing tunnels.

Build Alternatives

The Preferred Alternative is the most effective of the build alternatives examined during the EIS/EIR process at reducing the hours of congested operation compared to the 2010 No-Build Alternative or 1982 existing conditions. In 2010, the Preferred Alternative will result in congestion lasting from 1 to 2 hours per day on all key routes except the Southeast Expressway, which will experience about the same hours of congestion expected with the No-Build Alternative.

Alternatives that feature a Third Harbor Tunnel, elimination of the High-Level Bridge bottleneck, and the widening of a depressed Central Artery from 6 to 8 (10 in some sections) lanes (Alternatives 3A and 5A as well as the Preferred Alternative) provide substantial reductions in Central Artery hours of congestion relative to the No-Build Alternative.

With Alternatives 2, 3, 4, and 5, the northbound Central Artery south of the Callahan/Sumner Tunnels, and the southbound side of the Central Artery north of the tunnels both benefit, though not as much as with Alternatives 3A, 5A, and the Preferred Alternative. However, with Alternative 6, the Callahan/Sumner Tunnels will not experience congestion reduction, although the Central Artery both north and south of the Callahan/Sumner Tunnels will benefit due to its increased capacity.

In 2010, all build alternatives will redistribute traffic significantly as compared to the No-Build Alternative. With the Preferred Alternative, traffic volumes will be reduced on currently overloaded links, including the Callahan/Sumner Tunnels and Central Artery south; links such as Interstate Route 93 (north of the Charles River) and the Massachusetts Turnpike, which are currently underutilized, will carry more traffic. Furthermore, the Preferred Alternative will reduce the Callahan/Sumner Tunnels' AWDT by 33 percent in 2010. The Preferred Alternative will also decrease volumes on the Mystic-Tobin Bridge, but increase volumes on Route 1A north of the Airport, including at Bell Circle.

Central Artery Queues

Traffic benefits of each build alternative on Central Artery bottlenecks and queuing, and benefits on local streets, reflect the effectiveness of each alternative in achieving an overall transportation improvement. Because of its widened Central Artery, Third Harbor Tunnel, and improved connections between major highways, the Preferred Alternative provides major traffic benefits and is more effective at reducing queues than the remaining build alternatives. In 2010, the Preferred Alternative will provide 80 percent shorter individual queues than expected in 2010 with the No-Build Alternative.

Vehicle Miles Travelled (VMT)

In 2010 Alternative 6, the Artery only alternative, is the most effective of the build alternatives evaluated in this FEIS/FEIR at minimizing VMT compared to the No-Build Alternative. It generates approximately 15 million more VMT per year than the No-Build Alternative. The Preferred Alternative is the next most effective, generating 17.7 million more VMT than the No-Build Alternative. Of the remaining build alternatives, Alternatives 4, 2, 3, 5, 3A and 5A all increase VMT over the Preferred Alternative.

Person Hours Travelled (PHT)

In 2010, the Preferred Alternative is the most effective of the build alternatives at producing annual travel time savings relative to the No-Build Alternative. It reduces PHT by 17.6 million hours of travel per year. The best of the other build alternatives (Alternative 5) produced slightly more than half the travel time savings of the Preferred Alternative.

Levels of Service (LOS)

In 2010, the Preferred Alternative provides more substantial reductions in the number of roadway links and local intersections operating at LOS E or F than any of the other build alternatives. The Preferred Alternative produces a higher percentage of highway links and ramps operating at the acceptable range of LOS A-D than any of the build alternatives evaluated.

In the 2010 PM peak hour, the No-Build Alternative results in only 35 percent of the analyzed regional highway links operating at LOS A-D, while the Preferred Alternative results in 68 percent of all links and ramps analyzed operating at LOS A-D.

Similarly, the Preferred Alternative produces more significant LOS improvements on local streets and intersections in South Boston, East Boston and downtown Boston than any of the other build alternatives. For the intersections analyzed in East Boston, South Boston and downtown Boston, 43 percent will operate at LOS A-D in the 2010 PM peak hour with the No-Build Alternative. With the Preferred Alternative, the percentage of LOS A-D intersections will increase to 71 percent.

Safety

Of the build alternatives, Alternative 3A results in the most significant reductions in accident potential on the regional highway system compared to the No-Build Alternative (by 30 percent in 2010). The remaining build alternatives reduce accident potential in 2010 by 15-28 percent.

Accident experience on local streets is expected to be reduced very slightly, or stay about the same with the No-Build Alternative and build alternatives.

Hazardous Cargoes

Benefits to the movement of hazardous cargo result from the special routing features incorporated into each build alternative. Generally, the build alternatives benefit movement of hazardous cargoes in the same order as presented above for vehicle miles travelled. The Preferred Alternative, which results in the least amount of regional highway and surface street congestion in the long term, provides the most significant benefits for the movement of hazardous cargoes, especially for vehicles with origins or destinations in South Boston.

Emergency Vehicle Access

Emergency vehicle access improvements directly result from the design features of each alternative which promote regional travel time savings (e.g., a depressed, widened Central Artery, Third Harbor Tunnel, and improved connections between major highways). The Preferred Alternative provides more substantial travel time savings than any of the other build alternatives and, therefore, provides the most benefits to emergency vehicle access. The other build alternatives rank according to travel time savings listed previously in Table 28.

Logan Airport

The No-Build Alternative results in increased congestion on local East Boston routes leading to the Airport. Of the build alternatives, the Preferred Alternative is the most effective at providing congestion relief both north of the existing tunnels on Route 1A and for

ort users approaching from Inter- e Route 93 and Storrow Drive who merge onto the Central Artery. ddition, the proposed new South interchange with exclusive bus connections to the South Station sportation Center (SSTC) allows SSTC to become a remote passenger inal for Logan Airport. Of the ining build alternatives, Alterna- s 3A and 5A are more effective Alternatives 2, 3, 4 and 5 use they provide congestion relief h of the tunnels for Airport users oaching from Interstate Route 93 Storrow Drive. Alternative 6 and No-Build Alternative are less ctive because they result in eased congestion on local East on routes leading to the Airport.

ic Transportation

Public transportation services not be significantly interrupted ng construction of the Preferred rnative. In the long term, some ort-related trips will be diverted higher occupancy vehicles such as cabs, limousines, etc. back to the ate automobile due to the regional way improvements resulting from project. However, exclusive bus s have been incorporated into the erred Alternative's proposed South interchange (allowing the SSTC to e as a remote Logan Airport enger terminal). These ramps ide high quality connections to Central Artery, Southeast Express- and the Massachusetts Turnpike. ddition, more direct routings and ced delays on both the regional local roadway network are expected educe the small loss of transit rship by increasing bus transit rship to Logan Airport.

Because it will reduce conges- on the affected roadway network, Preferred Alternative will not improve MBTA and private carrier services for future passengers in the project area, but will also ice operating costs on a per-trip s for most regional bus trips g to and from downtown Boston, h Boston, and East Boston. While the Preferred Alternative eliminates many hours of congestion on the major highways and local streets in the project area, congestion will nonetheless occur in the morning and evening peak hours, and will be higher than existing on the Southeast Expressway (about the same as the No-Build Alternative in 2010). The bus lanes to and from the Southeast Expressway will be particularly effective in allowing buses to bypass Southeast Expressway congestion in peak hours going to and from downtown Boston.

Proposed highway tunnel construction will require structural strengthening of the MBTA's Blue and Red Line Tunnels where the Central Artery tunnel crosses over these tunnels. The Blue Line in East Boston north of the Airport will also be relocated. Commuter rail facilities at North Sation and in the South Station area will be temporarily relocated. In the South Bay area, occasional releveling of the railroad track bed is also expected. In all instances, transit service is not expected to be significantly disrupted.

Construction Staging

Traffic congestion during construction of all build alternatives would be minimized by careful phasing of construction work.

With the No-Build Alternative, redecking the Central Artery in the double-decked area north of Causeway Street (which will result in the loss of one lane at a time) and the narrowing of lanes on the Artery used for temporary by-pass at other locations along the Artery will reduce the capacity of the Artery during the construction period, resulting in more hours of congestion each day and longer peak period queues. Therefore, the No-Build Alternative (and all the build alternatives that do not depress the Artery, thereby still requiring its redecking) has a more substantial impact on regional traffic flow than the build alternatives (except Alternative 6) which include a depressed and widened Central Artery.

Table 29

AVERAGE WEEKDAY DAILY TRAFFIC (AWDT)
NO-BUILD AND PREFERRED ALTERNATIVES
(1982, 1990, 2010)

ROADWAY LINKS	1982 EXISTING	1990 NO-BUILD	1990 PREF. ALTER.	2010 NO-BUILD	2010 PREF. ALTER.	2010 % CHANGE VS. NO-BUILD
THIRD HARBOR TUNNEL	N/A	N/A	58,500	N/A	68,400	N/A
SUMNER/CALLAHAN TUNNEL	82,800	83,600	52,900	91,800	61,400	-33
TOBIN BRIDGE-north of I-93 RAMPS	72,500	73,900	59,500	79,100	63,700	-19
I-93 north of TOBIN BRIDGE RAMPS	89,450	102,200	111,800	106,000	117,500	+11
CENTRAL ARTERY						
between I-93 & Storrow Dr. Ramps	142,100	148,300	173,200	153,800	179,900	+17
between Causeway St. & Callahan/Sumner Tunnels	161,700	167,500	174,900	173,100	185,300	+7
between Callahan/Sumner & High St. Ramps	164,500	169,300	180,500	173,400	186,300	+7
between Atlantic Ave. & Beech St. Ramps	166,200	169,500	144,000	173,100	148,200	-14
between Albany St. & Mass. Ave. Ramps	153,700	167,200	180,400	169,400	187,400	+10
S.E. EXPRESSWAY						
between Columbia Rd. & Southampton St. Ramps	162,300	168,000	163,100	170,900	169,700	-1
south of Columbia Rd. Ramps	151,620	156,900	151,100	159,650	157,900	-1
MASS. TURNPIKE-west of Central Artery	71,200	79,600	97,600	80,000	103,000	+29
STORROW DR.-west of Copley Ramps	84,000	86,100	74,200	90,600	76,700	-15
ROUTE 1A-north of Neptune Road	30,825	35,800	51,300	40,000	51,000	+28

* One-way Volume

N/A - not applicable for this alternative

Table 29 (Cont.)

ROADWAY LINKS	1982 EXISTING	1990 NO-BUILD	1990 PREF. ALTER.	2010 NO-BUILD	2010 PREF. ALTER.	2010 % CHANGE VS. NO-BUILD
LOGAN AIRPORT ACCESS/ EGRESS RDS. (Main)	55,450	66,300	64,700	82,100	73,400	-11
PORTER ST.-between Cottage & Wellington Sts.	8,425	10,000	7,200	11,700	8,600	-26
MAVERICK ST.-between Cottage & Orleans Sts.	4,200*	4,300*	4,300*	4,700*	4,500*	-4
SUMNER ST.-between Orleans & Cottage Sts.	2,400*	2,500*	2,500*	2,700*	2,700*	0
MERIDIAN ST.-northwest of Condor St.	15,100	17,700	15,000	18,300	15,000	-18
BENNINGTON ST.-west of Route 1A	19,125	20,000	21,200	21,100	22,485	+6
COLUMBIA RD.-north of Columbia Circle	21,750	25,875	22,675	27,350	25,000	-9
L STREET-north of Day Blvd.	12,325	13,825	13,825	14,150	14,125	-1
EAST FIRST ST.-west of Summer St.	2,900	4,550	4,500	4,800	4,750	-1
D STREET-southwest of Summer St.	6,500	9,925	6,700	10,900	7,300	-33
SUMMER ST.-east of Fort Point Channel	27,000	35,475	22,550	36,450	23,750	-35
CONGRESS ST.-east of Fort Point Channel	11,000	14,550	15,900	15,500	16,400	+5
NORTHERN AVE.-east of Fort Point Channel	18,050	30,250	28,800	32,350	29,700	-8
DORCHESTER AVE.-south of A Street	23,450	25,450	27,100	25,650	28,400	+11
DORCHESTER AVE.-south of Summer St.	N/A	N/A	15,000*	N/A	16,200	N/A
FRONTAGE RD.-approach to W. Fourth St. Bridge	26,950*	27,200*	32,000*	27,600*	30,200*	+9
WEST FOURTH STREET BRIDGE	11,000	10,650	10,700	10,650	11,150	+5

* One-way Volume

N/A - not applicable for this alternative

Table 29 (Cont.)

ROADWAY LINKS	1982 EXISTING	1990 NO-BUILD	1990 PREF. ALTER.	2010 NO-BUILD	2010 PREF. ALTER.	2010 % CHANGE VS. NO-BUILD
BROADWAY BRIDGE	20,600	26,150	33,700	26,150	34,600	+8
ATLANTIC AVE.-between Summer & Congress Sts.	16,900*	20,300*	14,200*	20,700*	14,800*	-32
SEAPORT ACCESS RD.-southwest of Summer St.	N/A	8,300	N/A	9,300	N/A	N/A
STATE ST.-between Atlantic Ave. & Surface Artery	5,100*	10,400*	1,100*	12,500*	1,200*	-90
NORTH ST.-between Congress & Blackstone Sts.	16,500	19,800	16,600	25,800	17,200	-33
NORTH WASHINGTON ST.-						
south of Keany Sq.	21,550	34,400	12,500	35,100	12,600	-65
north of Cross St.	21,550	34,400	42,200	35,100	44,300	+26
between Keany & City Sqs.	44,000	45,600	23,800	49,200	27,200	-45
CROSS ST.-between Hanover & No. Washington Sts.	25,200*	27,800*	13,200*	31,000*	13,200*	-57
NEW CHARDON ST.-between North Washington & Merrimac Sts.	17,300*	20,300*	16,700*	25,000*	17,500*	-30
MERRIMAC ST.-between New Chardon & Sudbury Sts.	16,650	18,000	15,700	19,900	16,400	-18
NEW SUDBURY ST.-between Congress & Blackstone Sts.	12,450*	13,500*	23,700*	20,200*	24,300*	-20
COMMERCIAL ST.-northeast of Keany Sq.	18,650	20,500	15,700	24,800	16,200	-33
CAUSEWAY ST.-southwest of Keany Sq.	22,150	24,500	10,300	25,600	10,300	-60
HANOVER ST.-northeast of Cross St.	4,150	5,000	7,500	5,300	7,800	+50
CONGRESS ST.-between Sudbury & North Sts.	18,500	27,000	23,200	29,200	25,600	-12

* One-way Volume

N/A - not applicable for this alternative

However, the No-Build Alterna- involves significantly fewer s of construction and less disrup- of the Surface Artery and surface et system than any of the build rnatives. There will, however, be disruption of local street fic as congestion on the Central ry will result in much more t-cutting through areas in South on, downtown Boston, Charlestown, East Boston than at present. The ilt of this construction period uption would be a Central Artery the same vehicular capacity as y and even more congestion due to higher traffic volumes anticipated the long term.

In addition to the impacts cribed in the DEIS/DEIR, Alterna- es 2, 3, 4, and 5 (which involve the construction of a Third bor Tunnel and redecking of the ral Artery) will have construction acts similar to those described ve for the No-Build Alternative.

The Preferred Alternative, as l as Alternatives 5A and 3A, all substantial construction period acts on the local street network. struction of the South Boston tion of the Third Harbor Tunnel l commence simultaneously with rovements (i.e., widening and ression) to the Central Artery with se alternatives. The Third Harbor nel will be available for use prior the completion of Central Artery rovements and can divert traffic m the Artery while construction is erway. This feature of the de- ssed Central Artery/Third Harbor nel alternatives is particularly eficial during the period when the lahan/Sumner tunnels are reduced in acity as connections are being pleted to the depressed Central ery (through the closure of one e alternately for each tunnel for a iod of six months each). In ition, the depressed Central ery/Third Harbor Tunnel alterna- es allow for the maintenance of ffic on the existing Central Artery le the depressed Central Artery is ng constructed.

The construction of Alternative 6 has the most severe traffic impacts of the build alternatives because it involves a longer period of disruption for the Callahan/Sumner Tunnels, since traffic demand cannot be diverted to a Third Harbor Tunnel.

Parking Impacts

All alternatives have substantial impacts on public parking spaces in the project area, particularly due to loss of the surface lots under the Central Artery. All alternatives, including the No-Build Alternative, will displace these surface lots due to the construction activities which would take place at the ground level. Private parking spaces in the Fort Point Channel/South Boston area will be displaced by tunnel construction associated with the Preferred Alternative and Alternative 5A. Measures to mitigate parking losses have been included in the Preferred Alternative.

The following presents the transportation impacts of the Preferred Alternative and the No-Build Alternative.

4.2.2 Traffic Volumes

Average Weekday Daily Traffic (AWDT)

Average weekday daily traffic (AWDT) volumes for regional and local roadway links are summarized in Table 29 for existing conditions and for the forecast years of 1990 and 2010 for both the No-Build and the Preferred Alternatives. To account for changes in the Preferred Alternative since the SDEIS/SDEIR analyses were completed, additional roadway links have been analyzed in this document (see Table 29).

Unlike existing volumes, which are based on actual manual and automatic traffic recorder counts, future traffic volumes are "demand" volumes. These demand volumes, in some cases, exceed service or actual volumes that will occur at individual roadway locations. Where demand volumes are lower than capacity, they represent

anticipated traffic flow conditions; where demand volumes exceed the ability of a roadway to handle them, the implication is that peak hour congestion will spread into earlier and later hours of the day. The higher the demand volume to capacity ratio, the longer peak congestion will prevail.

Highway Network AWDT

Traffic Growth Without the Project. Section 3.1 TRANSPORTATION FACILITIES detailed anticipated traffic growth without the project (No-Build Alternative) between 1982 and 2010. Anticipated AWDT traffic growth on the regional highway network is as follows:

Typical 1982 - 2010 AWDT Increase (No-Build Alternative)

Interstate Route 93:	19%
Mystic-Tobin Bridge:	9%
Storrow Drive:	8%
Callahan/Sumner Tunnels:	11%
Central Artery:	10%
Massachusetts Turnpike:	12%
Southeast Expressway:	5%
Route 1A (north of the Airport):	30%

The high traffic increase on Route 1A reflects both the availability of excess highway capacity on this route and anticipated significant increases in airport-related traffic. Similarly, the increase in 2010 traffic on Interstate Route 93 reflects its excess capacity and anticipated population growth in the corridor it serves.

Future AWDT With the Preferred Alternative. Also given in Table 29 are percentage comparisons of the Preferred Alternative versus the No-Build Alternative AWDT's for the year 2010.

On a typical weekday, the Preferred Alternative will reduce AWDT by 33 percent in the existing Callahan/Sumner Tunnels when compared to the No-Build Alternative.

The Mystic-Tobin Bridge is also expected to experience a reduction of 19 percent in AWDT with the Preferred Alternative.

Compared to the No-Build Alternative, the Preferred Alternative increases AWDT by 7 percent on the Central Artery south of the existing tunnels but north of High Street. Volumes on the Central Artery to the north of the existing tunnels will increase by about 7 percent with the Preferred Alternative as well. However, this additional traffic can be handled with the Preferred Alternative, since the capacity of the Central Artery will be increased by 33 percent by being widened from 6 to 8 lanes in this area.

At the Revere/East Boston line, Route 1A is expected to carry about 11 percent more traffic with the Preferred Alternative than with the No-Build Alternative. South of the Route 1A/ Bennington Street ramps, AWDT with the Preferred Alternative is about 28 percent higher than in the No-Build Alternative. This suggests that cross-harbor traffic, including airport traffic, will not divert to East Boston and Chelsea local streets as much with the Preferred Alternative as it would with the No-Build Alternative. This traffic will instead use Route 1A, staying on the major highway network because the advantage of using local streets to bypass congestion on Route 1A will be lost due to the reduced congestion on Route 1A in the vicinity of the Callahan/Sumner Tunnels.

AWDT on the Massachusetts Turnpike (Interstate Route 90) is expected to increase by 29 percent with the Preferred Alternative. This is due to its direct connections to a Third Harbor Tunnel. It is also due to the increased capacity of the Central Artery which diverts trips from Storrow Drive to the Massachusetts Turnpike. Storrow Drive AWDT is expected to decrease by 15 percent when compared to the No-Build Alternative. AWDT changes on the remaining regional highway network will be 7 percent or less, expressed as a

entage of anticipated 2010 traffic mes with the No-Build Alternative.

Total harbor crossings tic-Tobin Bridge, Callahan/Sumner els, and the Third Harbor Tunnel) increase with the Preferred rnative by 13 percent -- 22,600 cles per day. This increase esents both new traffic and fic diverted from other routes. hermore, it reflects the extra s-harbor capacity created through combination of the existing els with the Third Harbor Tunnel, ovements at the existing tunnel ance, plus the increased capacity he Central Artery.

Local Street AWDT

AWDT Growth without the Proj-. To summarize findings provided ection 3.1 TRANSPORTATION LITIES, anticipated traffic growth local streets in South Boston, ntown Boston, and East Boston out the proposed project between 2 and 2010 are the follow- ing:

South Boston AWDT:

- Substantial AWDT increases (up to 52 percent) will occur on the selected roadway links between 1982 and 2010.

- The greatest AWDT increases (in excess of 35 percent) will occur on the Fort Point Channel bridges (Northern Avenue, Congress Street, and Summer Street) and streets which provide access to the northern industrial sector of South Boston (East First Street, D Street). This area is expected to experience a significant increase in development.

- AWDT increases on the remaining selected roadway links will be less than 30 percent; negligible changes (less than 10 percent) will occur on Dorchester Avenue south of A Street, Frontage Road, and West Fourth Street.

- The future Seaport Access Connector (to be constructed by others with the No-Build Alternative only) will connect Northern Avenue with West Second Street and will carry 9,300 vpd in 2010 south of Summer Street.

Downtown Boston AWDT:

- Due to increased density of employment generators in many different parts of Downtown Boston, as well as diversions from limited access highways operating at or near capacity conditions, traffic on selected local streets is expected to increase substantially in the future -- on the average about 43 percent -- with the No-Build Alternative.

- The largest increases in volumes for selected local streets with the No-Build Alternative are expected on North Washington Street (13,500 vpd) between Keany Square and Cross Street and on Congress Street (10,700 vpd) between Sudbury and North Streets.

- The lowest anticipated volume increases (15 to 20 percent range) were found on Merrimac and Causeway Streets (3,350 to 3,450 vpd).

East Boston AWDT:

- Airport access/egress roads will experience a 48 percent increase in AWDT between 1982 and 2010 because of significant increases in air travel demand as well as future airport development (specifically, Bird Island Flats).

- Selected roadway links (Bennington, Maverick, Sumner, and Meridian Streets) will experience AWDT increases ranging from 10 to 21 percent.

- Porter Street (assuming airport

connections), would experience a 39 percent increase in traffic.

Comparison of Future AWDT's With the Preferred and No-Build Alternatives

South Boston AWDT. AWDT's on selected links in South Boston generally decrease with the Preferred Alternative.

AWDT projections indicate that the Preferred Alternative diverts a substantial amount of truck and automobile traffic from South Boston streets when compared to the No-Build Alternative. Projections for 2010 AWDT are 9,300 vehicles per day for a small-scale Seaport Connector with the No-Build Alternative. These vehicles represent diversions from alternative South Boston street routings. With the Preferred Alternative, the two new South Boston interchanges would carry 41,100 vehicles per day. Of these vehicles, only 15,200 would be using the interchanges to gain access to the Third Harbor Tunnel. The remaining 25,900 vehicles would be using the interchange as access to and from the limited access roadway connecting the Central Artery with the Third Harbor Tunnel -- not the Tunnel itself. Therefore, compared to the No-Build Alternative, about 13,600 additional automobiles and 3,000 trucks will be diverted from South Boston Streets due to 1) the availability of direct access into the northern EDIC/Marine industrial area of South Boston via the Third Harbor Tunnel and proposed ramp connections to Congress Street, Summer Street, and Northern Avenue, and 2) the relocated Dorchester Avenue which provides better access to the downtown Boston Financial District from the south as well as access to the northern industrial area of South Boston.

Compared to the No-Build Alternative, the Preferred Alternative also decreases volumes slightly on Columbia Road north of Columbia Circle. Furthermore, the segment of relocated Dorchester Avenue between Broadway and Congress Street carries some traffic which would otherwise use A, D, or L Streets in South Boston, thereby reducing traffic on these streets. Traffic on the Summer Street Bridge and the Congress Street Bridge, across the Fort Point Channel, will increase by 16 percent and 5 percent respectively. These increases are caused by traffic which will be using the South Boston interchanges to the downtown Boston Financial District from the Seaport Access Tunnel and from the new Third Harbor Tunnel.

East Boston AWDT. In East Boston, traffic will generally be reduced or stay the same with the Preferred Alternative relative to the No-Build Alternative. In 2010, the Logan Airport access/egress roads, Meridian Street northwest of Condor Street, and Porter Street between Cottage and Wellington Streets will benefit most. Meridian Street traffic decreases by 3,300 vehicles per day or 18 percent. Porter Street traffic is expected to decrease approximately 26 percent. Bennington Street, west of Route 1A, will experience a slight (+6 percent) increase in AWDT. The other selected street links are expected to have volumes similar to the No-Build Alternative.

Downtown Boston AWDT. Traffic volumes on downtown Boston streets with the Preferred Alternative, with the exception of the streets mentioned below, are expected to be lower than or equal to those found with the No-Build Alternative.

In downtown Boston, future AWDT volumes on many of the streets selected for analysis are also heavily influenced by the design features of the Preferred Alternative. These design features include a relocated Dorchester Avenue to Congress Street, a widened, depressed Central Artery, and an improved Surface Artery.

For example, with the Preferred Alternative, 2010 AWDT volumes on North Street are 33 percent lower than the No-Build Alternative because North Street will no longer have direct

ess to Interstate Route 93 north-
d. State Street volumes are 90
ent lower than with the No-Build
rnative, primarily because of the
Pearl Street connection across the
ace Artery to the downtown Boston
ncial District. North Washington
eet in the Haymarket Square area is
percent higher than the No-Build
rnative due to the addition of
traffic from the Sumner Tunnel to
ace Artery traffic. South of
y Square, however, North Washing-
Street traffic will drop by 65
ent since more "through" traffic
be using the Central Artery.
over Street, just north of Cross
eet, is expected to experience a 50
ent increase in AWDT with the
ferred Alternative. Cross Street
ween Hanover and North Washington
eets will experience a 57 percent
rease over the No-Build Alternative
ause it will no longer be accommo-
ing traffic directly out of the
ner Tunnel.

AWDT volumes on many of the
ntown streets carrying north-south
ffic roughly parallel to the
tral Artery, such as Commercial
eet, Merrimac, and Congress Streets
expected to be reduced by 12 to 35
cent compared to the No-Build
ernative.

k Hour Traffic

AM and PM peak hour traffic
umes for the years 1982, 1990, and
0 are summarized in Table 30.
ure 30 locates the project roadway
ks, ramps, and intersections, and
ure 7 presented the existing links,
ps, and intersections contained in
le 30.

Affected Highway Network Peak Hour Traffic

During the AM and PM peak
rs, No-Build Alternative traffic
umes will increase substantially
ween 1982 and 2010. In addition to
gestion and queuing which now
urs during peak hours, peak periods
congestion are expected to extend
o additional hours of the day to accommodate increased traffic volumes. Volumes on the Southeast Expressway/Central Artery will be particularly high in both directions in the AM and PM peak hours, aggravated by increased traffic on the Massachusetts Turnpike (Interstate Route 90), Interstate Route 93, Route 1, and Route 1A corridors. Peak traffic volumes in the Callahan Tunnel are expected to increase by 40 percent while volumes in the Sumner Tunnel are expected to increase by 20 percent between 1982 and 2010. Mystic-Tobin Bridge peak hour traffic is expected to increase by 15 to 25 percent, depending upon the direction and the peak hour (AM or PM).

In effect, it is expected that with the No-Build Alternative, peak period congestion will also spread substantially. The end result of this spreading of congestion may be a peak hour which represents 34 percent of the 3-hour peak period traffic volumes (the computer-assigned traffic forecast time periods from which AM and PM peak hour traffic volumes were derived) rather than the 37-38 percent of the 3-hour peak period volumes assumed for this analysis. This means that the results of the traffic analysis are on the conservative or high side.

The Preferred Alternative generally will reduce traffic volumes in both 2010 peak hours on the existing cross-harbor highways compared to the No-Build Alternative, while increasing traffic volumes on the Central Artery. The most significant variations in traffic patterns follow:

- o Callahan Tunnel: 40 percent decrease;
- o Sumner Tunnel: 28 percent decrease;
- o Mystic-Tobin Bridge: 8 percent decrease, and;
- o Central Artery south of the existing Tunnels (north of Northern Avenue): 8 percent increase.

Local Streets/Intersections Peak Hour Traffic

South Boston Peak Hours. In South Boston, peak hour traffic volume increases without the project will be most significant at Andrew Square during both peak hours, and at the intersections of Dorchester Avenue with Summer and Congress Streets during the PM peak hour. At Andrew Square, this indicates that traffic will continue to bypass Southeast Expressway/Central Artery congestion by using Dorchester Avenue in South Boston; at the intersections of Dorchester Avenue with Summer and Congress Streets, increased traffic will accompany the future development in South Boston's northern industrial sector. Increases of 20 to 35 percent during both peak hours will also occur at the Herald Street/Broadway/Albany Street/Frontage Road and the Berkeley Street/West Fourth Street/Albany Street/Frontage Road intersections between 1982 and 2010 without the project.

With the No-Build Alternative, the current high peak hour (and off-peak) truck volumes on residential streets in South Boston will grow considerably due to future development in South Boston's northern industrial area. The June 1980 feasibility study entitled "Preliminary Environmental Assessment, Seaport Access System, South Boston, Massachusetts" identified, in detail, the magnitude of the problem of local street truck traffic. Survey data collected in December 1976 indicated that the northern industrial area of South Boston (east of the Fort Point Channel, north of Broadway and southwest of First Street) accounted for 7,100 of 9,400 daily truck trips that had origins and destinations in South Boston. In addition, another 1,000 trucks per day travel through South Boston between other destinations. The small-scale Seaport Access Road, as described in the report and assumed with the No-Build Alternative (referred to in this FEIS/FEIR as the Seaport Connector), would provide an alternative route for trucks travelling through South Boston to and from points to the south. The study showed that such a connector was capable of diverting 18 percent of all trucks coming to and from the northern industrial area. A large volume of trucks which would use the West Fourth Street and Broadway bridges to go to the northern industrial area would not be affected by the Seaport Connector.

The new South Boston interchanges with the proposed Seaport Access Alignment Tunnel, as provided with the Preferred Alternative, will improve upon the function of the small scale Seaport Connector by diverting many trucks from South Boston local streets. In the 2010 AM peak hour, this amounts to an additional 220 trucks and 2,200 automobiles (in the PM peak hour, 160 trucks and 940 automobiles) diverted from South Boston local streets. This represents 22 percent of anticipated truck volumes on local South Boston streets.

Compared to the No-Build Alternative, with the exception of Congress Street and Northern Avenue, peak hour volumes on South Boston streets in 2010 will either stay the same or decrease with the Preferred Alternative. For example, volumes on Dorchester Avenue are lower south of West Fourth Street and the Fort Point Channel. Both A and D Streets have lower peak hour volumes with the Preferred Alternative. Peak hour L Street traffic is expected to be about the same as found with the No-Build Alternative.

East Boston Peak Hours. In East Boston, peak hour traffic without the project will increase by 60 to 80 percent between 1982 and 2010 at the Airport Cross Road intersection due to future Airport development. Traffic on other streets in East Boston is also expected to grow substantially. Peak hour traffic volumes at Bell Circle in Revere will increase from 20 to 25 percent between 1982 and 2010 without the project.

With the Preferred Alternative, due to the presence of a Third Harbor

el, minor decreases in AM and PM hour traffic will occur on many the selected local streets in East on. Porter Street was assumed to open to Airport traffic in this ysis, and was expected to carry volumes of airport-related fic that will be diverting off 1A with the No-Build Alterna-. Porter Street particularly fits from the presence of a Third or Tunnel. However, with the erred Alternative, traffic through Circle is 5 percent greater than No-Build Alternative.

Downtown Boston Peak Hours. tantial increases in AM and PM hour traffic will occur at ral downtown intersections without project between 1982 and 2010, cially at some intersections along ntic Avenue where peak hour fic is expected to increase by oximately 24 percent in the AM hour and approximately 44 percent he PM peak hour.

Generally, in downtown Boston, all peak hour traffic volumes with Preferred Alternative are slightly r when compared to the No-Build rnative. As indicated in Table the Preferred Alternative general-educes downtown Boston local et traffic by diverting through fic from local streets and the ace Artery back to the Central ry -- where congestion is less that found with the No-Build rnative.

At Leverett Circle, peak hour fic volumes will increase with the uild Alternative, causing even er back-ups in peak hours than ently occur. Peak hour volumes congestion at Leverett Circle are ced with the Preferred Alternative.

3 V/C Ratios and Levels of Service

Volume/capacity (v/c) ratios, ating speeds, and levels of ice (LOS) for all alternatives ng the AM and PM peak hour for , 1990, and 2010 are summarized in e 31 for the selected major highway link, ramp sections, and local intersections.

The computed levels of service during the AM and PM peak hours for selected regional highway links, ramps, and intersections have been tabulated for the No-Build and Preferred Alternatives. This was done to offer an overview of total regional highway network impacts of the proposed project. They are summarized in Table 32. For the purpose of this study, three classes of level of service, as generally defined in the Traffic and Transportation Engineering Handbook, by the Institute of Transportation Engineers, were evaluated. Figure 8 in Section 3.1 TRANSPORTATION FACILITIES presented a pictorial representation of level of service.

1. A-D: Acceptable operating conditions in densely developed urban conditions; flow conditions range from free flow to near unstable; traffic densities increase from LOS A to LOS D.

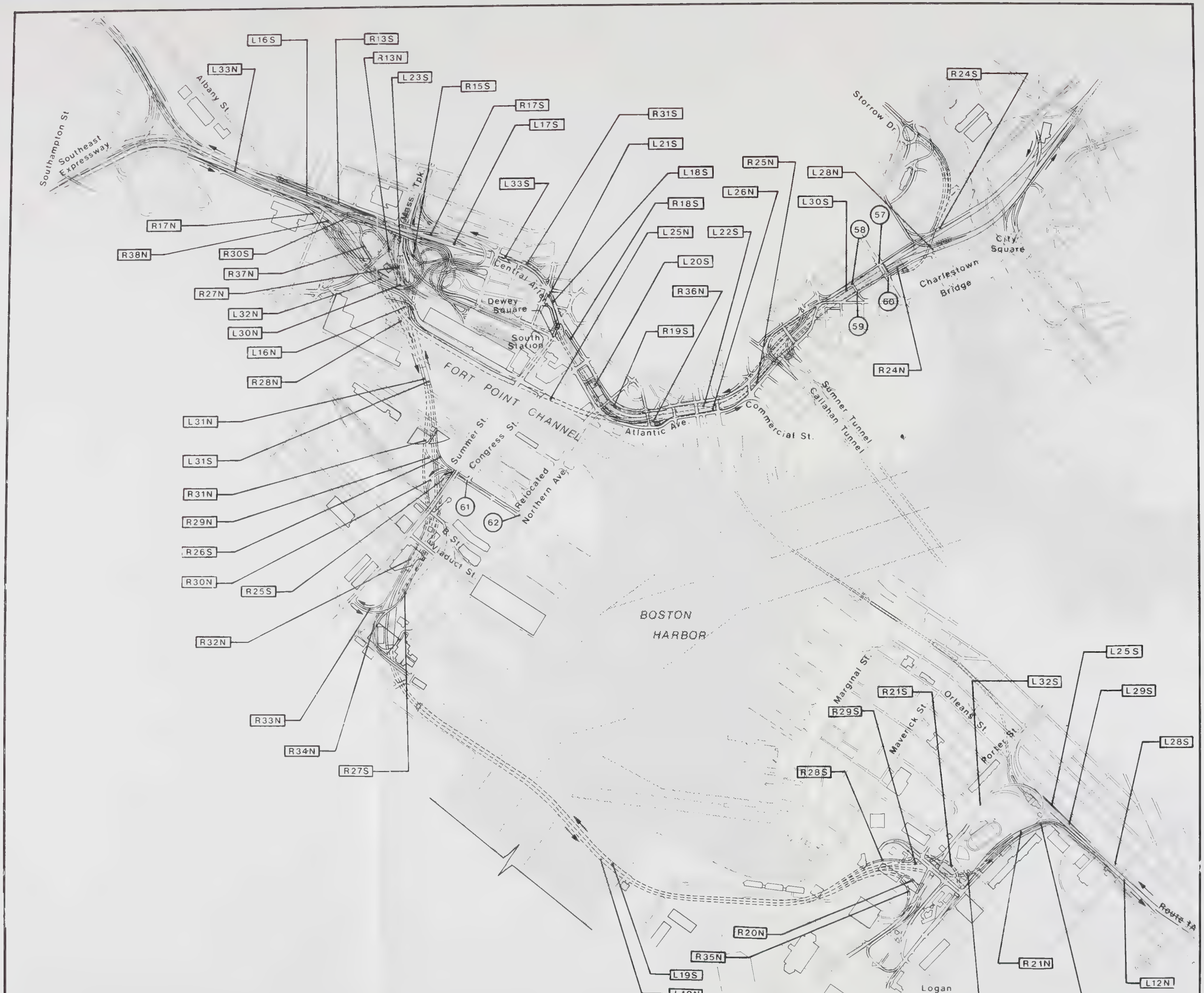
2. E: Unacceptable highly congested operating conditions, as traffic volumes are equal to, or below, capacity, and speeds are slow but moving.

3. F: Intolerable, forced-flow conditions, as traffic operations break down causing stop-and-go traffic; demand volume exceeds capacity.

The degree to which the Preferred Alternative minimizes overall network LOS E to LOS F operations and achieves LOS A to LOS D operating conditions is a key traffic measure of effectiveness.

Major Highway Links V/C's and LOS

Table 33 summarizes the level of service computations for individual highway links and ramps contained in Table 31. Table 33 provides a more simplified analysis of the critical regional highway links affected by the proposed project.



Note: For Existing Link, Ramp, and Intersection Identification, see Figure 7.

Figure 30
Preferred Alternative – Affected Roadway Network – Roadway Link, Ramp, and Intersection Identification Map

0 750 1500 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Legend

1 Intersection

L1N Roadway Link or Ramp

Table 30
TRAFFIC VOLUMES
AM AND PM PEAK HOURS
1982, 1990, 2010

		EXISTING		NO-BUILD ALTERNATIVE				PREFERRED ALTERNATIVE			
		1982		1990		2010		1990		2010	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
MAJOR HIGHWAY LINKS - NORTHBOUND											
L1N.	S.E. Expressway: Btwn. Columbia On - and Southampton Off-Ramps	7450	4350	8780	6030	9650	6590	9960	6330	10120	6700
L2N.	Frontage Road: Adjacent to Mass. Ave. Interchange	2580	1700	2770	1630	2810	1630	2700	1150	2700	1520
L33N.	S.E. Expressway: Before South Bay Connector/Herald St. Off-Ramp	NA	NA	NA	NA	NA	NA	9300	5030	9080	5070
L34N.	Central Artery: Btwn. Mass. Ave. On-Ramp and Connector CN-AT	NA	NA	NA	NA	NA	NA	4100	3370	5430	3630
L32N.	South Bay Connector: Btwn. W. Fourth On - and Mass. Tpk. Off-Ramps	NA	NA	NA	NA	NA	NA	3190	2810	3500	3030
L16N.	Fort Point Channel Tunnel: Before Merge with Central Artery Roadway	NA	NA	NA	NA	NA	NA	2660	1920	2660	2070
L19N.	Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	1370	3150	1820	2520
L3N.	S.E. Expressway: Btwn. E. Berkeley On - and Mass. Tpk. Off-Ramps	5780	3920	7940	5850	9420	6360	NA	NA	NA	NA
L4N.	Central Artery: Btwn. South St. On - and Northern Ave. Off-Ramps	6450	4200	7410	5620	9500	5620	NA	NA	NA	NA
L5N.	Central Artery: Btwn. Atlantic On - and Callahan Off-Ramps	5030	4080	5740	5740	6420	6030	NA	NA	NA	NA
L6N.	Central Artery: Btwn. Sumner On - and Causeway Off-Ramps	5540	4700	6000	5810	7220	6070	NA	NA	NA	NA
L7N.	Central Artery: Btwn. Storrow On - and Tobin Off-Ramps	3660	5350	3570	5740	4790	5850	5280	6030	5930	6140
L8N.	Mystic Tobin Bridge: North of I-93 Ramps	1580	3120	1900	3400	2010	3590	1980	3290	1980	3480
L9N.	I-93: North of Tobin Bridge Ramps	2000	4290	2240	4290	2740	4400	2770	5110	3230	5220
L10N.	Callahan Tunnel	2300	2850	2660	3740	3150	4070	1710	2150	2200	2480
L25N.	Central Artery Tunnel: Before Atlantic Ave./South St. On-Ramp	NA	NA	NA	NA	NA	NA	5590	4140	6000	4290
L26N.	Central Artery: Btwn. Atlantic On- and Surface Off-Ramps	NA	NA	NA	NA	NA	NA	6380	6620	7410	6620
L27N.	Central Artery: Btwn. Sumner On- and Storrow Off-Ramps	NA	NA	NA	NA	NA	NA	5970	5810	6920	5990
L28N.	Central Artery: Btwn. Causeway On- and Storrow On-Ramps	NA	NA	NA	NA	NA	NA	4670	4770	5020	5110
L30N.	Connector: Mass. Turnpike to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	1670	670	1820	890
L31N.	Third Harbor Tunnel: Btwn. Conn. CN-AT and Off-Ramp to Congress/S. Boston Access Rd.	NA	NA	NA	NA	NA	NA	3040	2150	3550	2550
L11N.	Route 1A: Btwn. Callahan Toll Plaza and Airport Off-Ramp	2050	2580	2470	3330	2890	3590	1710	2330	2520	2430
L24N.	Airport Tunnel: Btwn. Off-Ramp to Airport and Off-Ramp to Route 1A	NA	NA	NA	NA	NA	NA	570	1030	610	1180
L12N.	Route 1A: Btwn. Airport On - and Neptune Off-Ramps	930	2230	1220	2440	1330	2700	1520	3110	1630	3770
MAJOR HIGHWAY LINKS - EASTBOUND AND WESTBOUND											
L1E.	Mass. Turnpike, Eastbound; West of Expressway Ramps	4400	2080	4830	2520	4860	2920	5090	2810	5280	3070
L1W.	Mass. Turnpike, Westbound; West of Expressway Ramps	1450	3180	2550	3400	2700	3660	3080	4140	3380	4370
L2E.	Storrow Drive, Eastbound; West of Copley Square Ramps	3450	2600	3460	3000	3990	3110	3530	2740	3990	2890
L2W.	Storrow Drive, Westbound; West of Copley Square Ramps	2430	3440	3340	3960	3150	4030	3380	4110	4180	4400
MAJOR HIGHWAY LINKS - SOUTHBOUND											
L1S.	S.E. Expressway: Btwn. Southampton On - and Columbia Off-Ramps	3370	5350	5130	8290	5660	8770	5280	8580	5660	9180
L2S.	S.E. Expressway: Btwn. Mass. Ave. On - and Southampton Off-Ramps	3920	6150	5700	9360	6190	10430	5780	9660	6270	10180
L3S.	S.E. Expressway: Btwn. Albany On - and Mass. Ave. Off-Ramps	4540	5750	5170	8360	5400	8700	5470	9290	5740	9440
L4S.	Central Artery: Btwn. Kneeland On - and Albany Off-Ramps	4350	4570	5620	8070	6160	8330	NA	NA	NA	NA
L16S.	Central Artery: South of Kneeland St./Mass. Tpk. On-Ramp	NA	NA	NA	NA	NA	NA	3990	6850	4100	6850
L17S.	Central Artery: South of Thru Rdwy./Local Rdwy. Merge	NA	NA	NA	NA	NA	NA	3380	5550	3420	5550
L5S.	Central Artery: Btwn. Congress On - and Beach Off-Ramps	4730	4500	5430	6550	5700	6880	NA	NA	NA	NA
L18S.	Central Artery Local Rdwy: Btwn. Purchase On - and Beach Off-Ramps	NA	NA	NA	NA	NA	NA	2700	3370	2700	3700
L19S.	Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	1750	1700	1860	2150
L20S.	Central Artery Local Rdwy: South of Thru Rdwy./Local Rdwy. Split	NA	NA	NA	NA	NA	NA	2470	2180	2470	2330
L21S.	Central Artery Thru Rdwy: South of Thru Rdwy./Local Rdwy. Split	NA	NA	NA	NA	NA	NA	2360	2810	2430	2810
L33S.	Central Artery Thru Rdwy: South of Essex St. On-Ramp	NA	NA	NA	NA	NA	NA	2930	4590	3040	4590
L6S.	Central Artery: Btwn. Purchase On - and Dewey Square Off-Ramps	5050	3880	5590	5960	5850	6140	NA	NA	NA	NA
L7S.	Central Artery: Btwn. Haymarket On - and High Off-Ramps	5850	3530	5740	5220	6190	5400	NA	NA	NA	NA
L22S.	Central Artery: Btwn. Haymarket On - and Purchase Off-Ramps	NA	NA	NA	NA	NA	NA	6160	5960	6230	6030
L8S.	Central Artery: Btwn. Causeway On - and Callahan Off-Ramps	5570	3550	5470	4850	6080	5180	NA	NA	NA	NA
L9S.	Central Artery: Btwn. Storrow On - and Haymarket Off-Ramps	5220	2740	5170	4140	6190	4180	NA	NA	NA	NA
L10S.	Central Artery: Btwn. Tobin On - and Storrow Off-Ramps	5430	3710	4790	4030	6190	4030	5740	5180	7940	5370
L11S.	Mystic Tobin Bridge: North of I-93 Ramps	3060	2180	3340	2220	3720	2480	3190	2000	3350	2110
L12S.	I-93: North of Tobin Bridge Ramps	3980	2150	3460	2850	4030	3000	4030	3590	5210	3850
L13S.	Sumner Tunnel	3160	2640	3460	2810	3690	3260	2200	1590	2620	2000
L30S.	Central Artery: Btwn. Storrow On- and Callahan Off-Ramps	NA	NA	NA	NA	NA	NA	5470	5180	6230	5510
L23S.	Fort Point Channel Tunnel: Btwn. Mass. Tpk. Off - and Herald Off-Ramps	NA	NA	NA	NA	NA	NA	1140	1590	1290	1890
L31S.	Third Harbor Tunnel: Btwn. Congress On- and Mass. Tpk. Off-Ramps	NA	NA	NA	NA	NA	NA	1670	2330	1820	2780
L14S.	Route 1A: Btwn. Airport On-Ramp and Sumner Toll Plaza	1510	1930	1630	1780	1750	2070	1300	1910	2240	1910
L25S.	Route 1A: Btwn. Airport/Third Harbor Off - and Airport On-Ramps	NA	NA	NA	NA	NA	NA	990	870	990	870
L15S.	Route 1A: Btwn. Neptune On - and Airport Off-Ramps	1750	1620	1440	1040	1440	1150	NA	NA	NA	NA
L28S.	Route 1A: Btwn. Neptune On-Ramp & Off-Ramp to Airport & Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	2360	2200	3120	2200
L29S.	Connector: Route 1A to Third Harbor Tunnel and Airport	NA	NA	NA	NA	NA	NA	1980	1330	2130	1650
L32S.	Airport Access Rdwy.: Btwn. Rte. 1A Ramps and Off-Ramp to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	3150	2750	4150	3360

Table 30 (Cont'd.)
TRAFFIC VOLUMES
AM AND PM PEAK HOURS
1982, 1990, 2010

		EXISTING		NO-BUILD ALTERNATIVE				PREFERRED ALTERNATIVE			
		1982		1990		2010		1990		2010	
MAJOR HIGHWAY RAMPS - NORTHBOUND		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
R1N.	Columbia Rd. Off; from S.E. Expressway	500	260	570	300	680	330	530	150	680	150
R2N.	Mass. Avenue On; to S.E. Expressway	460	200	1520	700	2010	700	1000	580	1620	800
R13N.	Ramp: Frontage Rd. to Central Artery	NA	NA	NA	NA	NA	NA	1560	1040	1560	1180
R37N.	Ramp: Herald St. to Central Artery/Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	720	930	720	930
R3N.	Mass Tpk. On; to Central Artery	1600	700	1750	700	2320	700	NA	NA	NA	NA
R4N.	Atlantic Ave. Off; from Central Artery	2360	1540	3840	2110	4940	2110	NA	NA	NA	NA
R5N.	Atlantic Ave. On; to Central Artery	220	800	840	1000	840	1150	910	1740	990	1740
R36N.	Atlantic Ave./Essex St. On; to Central Artery	NA	NA	NA	NA	NA	NA	1290	2440	1410	2440
R6N.	Callahan Tunnel Off; from Central Artery	1330	730	1250	1410	1330	1550	NA	NA	NA	NA
R7N.	Sumner Tunnel On; to Central Artery	1420	1350	1560	1520	2130	1590	1220	1040	1710	1260
R8N.	Storrow Drive Off; from Central Artery	1900	1100	1820	1630	2470	1670	1820	2110	2470	2260
R9N.	Storrow Drive On; to Central Artery	1200	2000	1200	2250	1400	2300	650	1260	950	1260
R24N.	Causeway St. On; to Central Artery	NA	NA	NA	NA	NA	NA	530	1070	530	1370
R25N.	Surface Artery Off; from Central Artery	NA	NA	NA	NA	NA	NA	2130	1850	2200	1850
R17N.	Ramp: Central Artery to Herald St./South Bay Connector	NA	NA	NA	NA	NA	NA	4200	2240	5270	2240
R38N.	W. Fourth St. On; to South Bay Connector	NA	NA	NA	NA	NA	NA	1030	740	1030	960
R27N.	Mass. Turnpike On; to Fort Point Channel Tunnel	NA	NA	NA	NA	NA	NA	650	290	680	330
R28N.	Connector: Central Artery to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	1180	1110	1520	1440
R31N.	Ramp: Third Harbor Tunnel to Congress St./S. Boston Access Rd.	NA	NA	NA	NA	NA	NA	1820	440	1860	440
R29N.	Congress St. Off; from Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	840	150	950	210
R30N.	Congress St. On; to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	190	440	270	440
R32N.	South Boston Access Road	NA	NA	NA	NA	NA	NA	990	300	990	300
R33N.	Ramp: South Boston Access Road to Summer St.	NA	NA	NA	NA	NA	NA	670	190	670	210
R34N.	Ramp: South Boston Access Road to Northern Ave.	NA	NA	NA	NA	NA	NA	320	70	320	80
R10N.	Airport Off; from Route 1A	1390	1270	1710	1850	2130	2110	1180	1180	1820	1480
R11N.	Airport On; to Route 1A	270	920	460	960	570	1220	NA	NA	NA	NA
R20N.	Ramp: Third Harbor Tunnel to Airport	NA	NA	NA	NA	NA	NA	590	320	790	410
R21N.	Ramp: Third Harbor Tunnel to Route 1A	NA	NA	NA	NA	NA	NA	570	1030	610	1180
R22N.	Airport/Third Harbor Tunnel On; to Route 1A	NA	NA	NA	NA	NA	NA	990	2070	1030	2730
R35N.	Ramp: Third Harbor Tunnel to Bird Island Flats.	NA	NA	NA	NA	NA	NA	210	710	430	920
MAJOR HIGHWAY RAMPS - SOUTHBOUND											
R1S.	Columbia Rd. On; to S.E. Expressway	400	1900	480	1980	480	2050	150	810	190	810
R2S.	Mass. Ave. Off; from S.E. Expressway	720	500	720	640	860	720	340	670	340	670
R3S.	Albany St. On; to S.E. Expressway	600	1900	490	2290	490	2290	1520	2480	1630	2700
R13S.	Ramp: Fort Point Channel Tunnel to S.E. Expressway	NA	NA	NA	NA	NA	NA	1030	1260	1140	1410
R30S.	Ramp: Fort Point Channel Tunnel to Herald St.	NA	NA	NA	NA	NA	NA	110	330	150	480
R15S.	Ramp: Fort Point Channel Tunnel to Mass. Tpk.	NA	NA	NA	NA	NA	NA	530	780	530	890
R4S.	Mass. Tpk./Albany St. Off; from Central Artery	1260	1300	1260	1410	1510	1670	1560	2180	1670	2220
R17S.	Ramp: Mass. Tpk./Kneeland St. to Central Artery	NA	NA	NA	NA	NA	NA	610	960	720	1260
R31S.	Surface Artery/Essex St. On; to Central Artery	NA	NA	NA	NA	NA	NA	610	1780	610	1780
R5S.	Dewey Sq. Off; from Central Artery	750	480	720	520	840	520	1030	670	1030	670
R6S.	High St. Off; from Central Artery	1300	550	1100	560	1330	560	NA	NA	NA	NA
R18S.	Purchase St. On; to Central Artery	NA	NA	NA	NA	NA	NA	1220	1850	1220	2040
R19S.	Ramp: Central Artery to Purchase St.	NA	NA	NA	NA	NA	NA	1330	960	1330	960
R7S.	Haymarket On; to Central Artery	1560	1890	1750	1740	2050	1740	1560	1810	1560	1890
R8S.	Callahan Tunnel Off; from Central Artery	1280	1710	1520	1370	1940	1440	870	1040	1220	1260
R9S.	Storrow Drive On; to Central Artery	1500	850	2050	1150	2130	1180	2280	1700	2280	2000
R10S.	Storrow Drive Off; from Central Artery	1720	1820	1630	1870	2130	1920	NA	NA	NA	NA
R24S.	Storrow Drive/Causeway St. Off; from Central Artery	NA	NA	NA	NA	NA	NA	2550	1700	3570	1850
R25S.	Congress St. Off; from Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	420	330	420	370
R27S.	Summer St./Northern Ave. On; to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	190	480	230	560
R26S.	Congress St. On; to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	190	480	190	520
R11S.	Airport Off; from Route 1A	770	530	870	670	1030	850	NA	NA	NA	NA
R12S.	Airport On; to Route 1A	530	850	1060	1400	1300	1780	910	1040	1250	1370
R21S.	Ramp: Airport to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	570	1000	620	1160
R28S.	Ramp: Bird Island Flats to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	60	150	60	180
R29S.	Ramp: Airport Access Road to Third Harbor Tunnel	NA	NA	NA	NA	NA	NA	1120	550	1180	810

Table 30 (Cont'd.)
TRAFFIC VOLUMES
AM AND PM PEAK HOURS
1982, 1990, 2010

INTERSECTIONS	EXISTING		NO-BUILD ALTERNATIVE				PREFERRED ALTERNATIVE			
	1982		1990		2010		1990		2010	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
South Boston										
1. Columbia Circle	5260	4340	6150	5030	6200	5710	5020	4640	4970	4990
2. Andrew Square	2000	1650	3070	2980	3160	3210	2740	2840	2730	2870
3. Columbia Rd./Day Blvd./L St.	1390	1450	1370	1480	1370	1530	1300	1470	1300	1510
4. L St./East First St./Summer St.	1500	1550	1890	1810	1910	1860	1900	1810	1930	1880
5. Dorchester Ave./W. 5th St./A St.	2300	2140	2410	2200	2440	2550	2270	2200	2350	2320
6. Dorchester Ave./W. 4th St.	2230	2060	2390	2100	2450	2310	2660	2150	2440	2370
7. Dorchester Ave./W. Broadway (Herald St. Ext.)	2650	2750	2690	2210	2790	2460	3490	2110	3700	2230
8. Summer St./Dorchester Ave.	2650	2400	3120	4060	3140	4080	4380	4060	4640	4100
9. Summer St./Melcher St.	2340	2040	2800	2960	2770	3040	2610	3070	2750	3110
10. Summer St./D St.	2380	2220	2610	2570	2410	2600	1880	2450	1950	2490
11. Congress St./Dorchester Ave.	2020	1730	2300	3390	2320	3540	2670	3550	2920	3680
12. Congress St./A St.	950	1080	1240	2010	1240	2150	1730	2070	1920	2240
13. Northern Ave./Sleeper St.	1270	1730	2660	2370	2690	2410	2460	2420	2740	2490
14. Herald St./Herald St. Ext./Albany St.	3670	4140	4910	4330	4960	5000	5310	5430	5780	6000
15. Berkeley St./W. Fourth St./Frontage Rd./Albany St.	4530	4410	5910	6440	6090	5700	3490	3300	3690	4110
61. Congress St./Third Harbor Tunnel Ramps	NA	NA	NA	NA	NA	NA	1780	1610	1860	2010
62. Northern Ave./Third Harbor Tunnel Ramps Ext.	NA	NA	NA	NA	NA	NA	2060	1620	2080	1660
63. Northern Ave./Third Harbor Tunnel Ramps at General Ship	NA	NA	NA	NA	NA	NA	1260	1150	1230	1190
64. Summer St./Third Harbor Tunnel Ramps	NA	NA	NA	NA	NA	NA	2190	2380	2330	2420
65. Herald St. Ext./Relocated Dorchester Ave./Expressway Off-Ramp	NA	NA	NA	NA	NA	NA	5760	3130	6600	3470
East Boston and Revere										
16. Sumner St./Meridian St./Chelsea St.	620	720	690	880	690	890	740	870	760	890
17. Sumner St./Bremen St.	460	550	520	550	460	550	560	550	560	550
18. Maverick St./Meridian St./Chelsea St.	1080	1180	1030	1250	1030	1280	1130	1230	1030	1160
19. Maverick St./Bremen St.	480	510	480	540	480	540	480	540	480	510
20. Maverick St./Jeffries St./Airport Access Rd.	380	320	380	320	380	320	310	320	380	300
21. Porter St./Chelsea St./Visconti Rd.	1560	1500	2120	1850	2430	2170	1090	1010	1460	1270
22. Porter St./Bremen St.	980	1290	1000	1320	1220	1510	790	890	850	1060
23. Porter St./Orleans St.	570	790	820	880	1020	1030	640	620	780	770
24. Porter St./Cottage St.	540	670	770	810	990	970	550	510	720	680
25. Central Square (Meridian St./Saratoga St.)	1000	1040	1170	1210	1260	1230	1260	1210	1340	1230
26. Porter St./London St.	850	670	930	840	1060	990	500	410	610	460
27. Bennington St./Prescott St.	1150	930		NO DATA AVAILABLE				NO DATA AVAILABLE		
28. Chelsea St./East Eagle St.	1070	1190	910	940	1020	1130	1040	850	1160	620
29. Bennington St./Neptune Rd.	2370	1890		NO DATA AVAILABLE				NO DATA AVAILABLE		
30. McClellan Off-Ramp/Neptune Rd.	920	1460	1000	1330	1140	1460	1170	1160	1320	1330
31. Condor St./Meridian St.	1070	1330	1300	1330	1470	1630	1180	1380	1380	1520
32. Airport Crossover Roads	3630	4860	5380	6390	5640	7870	NA	NA	NA	NA
33. Bell Circle (Revere)	3860	4470	4760	5150	4870	5420	5130	5360	5190	5700
66. Connector Rd./Airport Crossover Rd.	NA	NA	NA	NA	NA	NA	2200	1910	2840	2240
67. Service Rd./Airport Crossover Rd.	NA	NA	NA	NA	NA	NA	650	800	830	1000
68. American Airline Frontage Rd./Airport Egress Rd.	NA	NA	NA	NA	NA	NA	2400	3800	2880	4860
Downtown Boston and Charlestown										
34. Kneeland St./Surface Artery/S.B. On-Ramp	2550	3240	3650	4010	3370	3990	2190	3910	2050	3260
35. Dewey Sq.	3770	4890	6210	5970	5870	6280	3530	3820	3450	3410
36. Atlantic Ave./Congress St.	3040	2740	5010	4160	4490	4790	2340	2050	2400	2180
37. Atlantic Ave./Northern Ave.	2440	3560	4790	3860	4740	4440	2640	3560	2720	3590
38. Atlantic Ave./Surface Artery/High St.	3220	3420	5700	4220	6230	4070	1050	1470	1020	1950
39. Purchase St./Congress St.	2250	2970	2400	2960	2620	3140	1380	3560	1470	3480
40. North St./Blackstone St./S.B. Off-Ramp	2710	3540	4040	4000	4580	4400	2480	1860	2990	2060
41. Cross St./Hanover St./Salem St.	2070	2110	2840	2360	2680	2610	2940	2450	3590	2740
42. Leverett Circle	6720	6260	6860	6420	6560	6770	6040	5350	6100	5660
45. Congress St./North St.	1920	2300	2610	2630	3010	2630	2450	1960	2630	2220
46. City Square (Charlestown)	3690	3680	6570	7400	6050	7850	6030	6720	5590	7200
47. Causeway St./North Washington St./Commercial St.	4260	4610	4930	5910	4410	6620	4180	5470	3330	5880
48. Causeway St./Lomasney Way/Merrimac St./Staniford St.	1860	1880	2170	2280	2060	2410	2510	2400	1780	2550
49. New Chardon St./Merrimac St.	2910	2200	2700	2550	2570	2630	3110	1910	3130	2090
50. New Chardon St./North Washington St.	2640	2070	2590	2480	2360	2670	4250	4990	4870	5320
51. Sudbury St./Congress St./Merrimac St.	1760	3180	2480	3330	2280	3350	3140	3780	3640	3880
52. Surface Artery/Hanover St.	NA	NA	NA	NA	NA	NA	2630	1930	3150	2050
53. Commercial St./Hanover St.	1300	1620	1590	2260	1670	2220	1180	1450	990	930
54. State St./Atlantic Ave.	1560	1950	2130	2950	2260	2880	610	1440	610	1540
55. State St./Surface Artery	2110	2840	3060	3110	2700	3450	2300	1470	2300	1520
56. Sudbury St./Blackstone St./S.B. On-Ramp	950	1710	1870	2480	1860	2730	3720	4270	3030	4150
57. Causeway St./S.B. Off-Ramp	NA	NA	NA	NA	NA	NA	3140	3040	3160	3160
58. North Washington St. (S.B. Roadway)/S.B. Off-Ramp Ext.	NA	NA	NA	NA	NA	NA	2760	2040	2250	2040
59. North Washington St. (S.B. Roadway)/N.B. On-Ramp Ext.	NA	NA	NA	NA	NA	NA	2750	2290	2330	2320
60. Causeway St./N.B. On-Ramp	NA	NA	NA	NA	NA	NA	2380	2730	2050	3120

Table 31
AM AND PM PEAK HOURS
VOLUME-TO-CAPACITY RATIO (V/C),
AND LEVELS OF SERVICE (LOS)
1982, 1990, 2010

EXISTING and NO-BUILD ALTERNATIVE

		EXISTING 1982 AM			EXISTING 1982 PM			NO-BUILD 1990 AM			NO-BUILD 1990 PM			NO-BUILD 2010 AM			NO-BUILD 2010 PM		
		V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS
MAJOR HIGHWAY LINKS - NORTHBOUND																			
L1N.	S.E. Expressway: Btwn. Columbia On - and Southampton Off-Ramps	1.03	30	F	0.60	40	C	1.22	25	F	0.83	35	E	1.34	20	F	0.91	35	E
L2N.	Frontage Road: Adjacent to Mass. Ave. Interchange	0.69	30	D	0.46	40	B	0.74	25	D	0.44	40	B	0.76	25	D	0.42	40	B
L33N.	S.E. Expressway: Before South Bay Connector/Herald St. Off-Ramp	NA			NA			NA			NA			NA			NA		
L34N.	Central Artery: Btwn. Mass. Ave. On-Ramp and Connector CN-AT	NA			NA			NA			NA			NA			NA		
L32N.	South Bay Connector: Btwn. W. Fourth On - and Mass. Tpk. Off-Ramps	NA			NA			NA			NA			NA			NA		
L16N.	Fort Point Channel Tunnel: Before Merge with Central Artery Roadway	NA			NA			NA			NA			NA			NA		
L19N.	Third Harbor Tunnel	NA			NA			NA			NA			NA			NA		
L3N.	S.E. Expressway: Btwn. E. Berkeley On - and Mass. Tpk. Off-Ramps	1.10	30	F	0.75	30	F	1.10	30	F	0.81	30	F	1.31	20	F	0.88	25	F
L4N.	Central Artery: Btwn. South St. On - and Northern Ave. Off-Ramps	1.13	20	F	0.75	15	F	1.29	15	F	1.01	15	F	1.62	10	F	1.00	15	F
L5N.	Central Artery: Btwn. Atlantic On - and Callahan Off-Ramps	0.96	30	F	0.78	15	F	1.06	25	F	1.06	15	F	1.19	20	F	1.11	15	F
L6N.	Central Artery: Btwn. Sumner On - and Causeway Off-Ramps	0.90	35	E	0.79	15	F	1.06	25	F	0.99	15	F	1.24	20	F	1.00	15	F
L7N.	Central Artery: Btwn. Storrow On - and Tobin Off-Ramps	0.89	25	F	1.30	15	F	0.68	40	C	1.46	15	F	0.91	30	C	1.50	15	F
L8N.	Mystic Tobin Bridge: North of I-93 Ramps	0.40	50	A	0.78	45	C	0.48	45	A	0.85	40	D	0.50	45	A	0.90	35	E
L9N.	I-93: North of Tobin Bridge Ramps	0.28	50	A	0.59	50	C	0.31	50	A	0.59	50	C	0.38	50	A	0.61	50	C
L10N.	Callahan Tunnel	0.85	35	D	1.06	20	F	0.99	30	E	1.39	20	F	1.17	20	F	1.51	15	F
L25N.	Central Artery Tunnel: Before Atlantic Ave./South St. On-Ramp	NA			NA			NA			NA			NA			NA		
L26N.	Central Artery: Btwn. Atlantic On- and Surface Off-Ramps	NA			NA			NA			NA			NA			NA		
L27N.	Central Artery: Btwn. Sumner On- and Storrow Off-Ramps	NA			NA			NA			NA			NA			NA		
L28N.	Central Artery: Btwn. Causeway On- and Storrow On-Ramps	NA			NA			NA			NA			NA			NA		
L30N.	Connector: Mass. Turnpike to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA		
L31N.	Third Harbor Tunnel: Btwn. Conn. CN-AT and Off-Ramp to Congress/S. Boston Access	NA			NA			NA			NA			NA			NA		
L11N.	Route 1A: Btwn. Callahan Toll Plaza and Airport Off-Ramp	0.36	35	C	0.45	30	C	0.44	30	C	0.58	20	C	0.51	25	C	0.63	20	C
L24N.	Airport Tunnel: Btwn. Off-Ramp to Airport and Off-Ramp to Route 1A	NA			NA			NA			NA			NA			NA		
L12N.	Route 1A: Btwn. Airport On - and Neptune Off-Ramps	0.17	45	A	0.39	40	B	0.22	45	A	0.43	40	B	0.24	45	A	0.47	35	C
MAJOR HIGHWAY LINKS - EASTBOUND AND WESTBOUND																			
L1E.	Mass. Turnpike, Eastbound; West of Expressway Ramps	0.80	40	D	0.37	45	C	0.87	30	E	0.45	45	C	0.88	30	E	0.52	45	C
L1W.	Mass. Turnpike, Westbound; West of Expressway Ramps	0.27	55	A	0.58	55	B	0.46	55	B	0.62	55	B	0.49	55	B	0.66	50	C
L2E.	Storrow Drive, Eastbound; West of Copley Square Ramps	0.59	40	C	0.45	40	C	0.59	40	C	0.51	40	C	0.69	40	C	0.53	40	C
L2W.	Storrow Drive, Westbound; West of Copley Square Ramps	0.42	40	C	0.59	40	C	0.57	40	C	0.68	40	C	0.67	40	C	0.69	40	C
MAJOR HIGHWAY LINKS - SOUTHBOUND																			
L1S.	S.E. Expressway: Btwn. Southampton On - and Columbia Off-Ramps	0.62	50	B	0.74	30	F	0.71	40	D	1.15	30	F	0.78	40	D	1.22	30	F
L2S.	S.E. Expressway: Btwn. Mass. Ave. On - and Southampton Off-Ramps	0.62	50	A	0.85	30	E	0.64	40	D	1.21	25	F	0.70	30	F	1.35	20	F
L3S.	S.E. Expressway: Btwn. Albany On - and Mass. Ave. Off-Ramps	0.73	35	D	0.95	20	F	0.60	45	B	1.13	20	F	0.63	40	C	1.17	20	F
L4S.	Central Artery: Btwn. Kneeland On - and Albany Off-Ramps	0.74	40	C	0.72	20	F	0.78	25	F	1.13	20	F	0.85	25	F	1.16	20	F
L16S.	Central Artery: South of Kneeland St./Mass. Tpk. On-Ramp	NA			NA			NA			NA			NA			NA		
L17S.	Central Artery: South of Thru Rdwy./Local Rdwy. Merge	NA			NA			NA			NA			NA			NA		
L5S.	Central Artery: Btwn. Congress On - and Beach Off-Ramps	0.78	35	E	0.75	20	F	0.90	25	F	1.10	15	F	0.91	20	F	1.12	15	F
L18S.	Central Artery Local Rdwy: Btwn. Purchase On - and Beach Off-Ramps	NA			NA			NA			NA			NA			NA		
L19S.	Third Harbor Tunnel	NA			NA			NA			NA			NA			NA		
L20S.	Central Artery Local Rdwy: South of Thru Rdwy./Local Rdwy. Split	NA			NA			NA			NA			NA			NA		
L21S.	Central Artery Thru Rdwy: South of Thru Rdwy./Local Rdwy. Split	NA			NA			NA			NA			NA			NA		
L33S.	Central Artery Thru Rdwy: South of Essex St. On-Ramp	NA			NA			NA			NA			NA			NA		
L6S.	Central Artery: Btwn. Purchase On - and Dewey Square Off-Ramps	0.83	30	E	0.65	25	F	0.92	25	F	1.02	20	F	0.97	20	F	1.05	20	F
L7S.	Central Artery: Btwn. Haymarket On - and High Off-Ramps	1.08	30	F	0.64	25	F	1.05	25	F	0.94	25	F	1.14	20	F	0.98	25	F
L22S.	Central Artery: Btwn. Haymarket On - and Purchase Off-Ramps	NA			NA			NA			NA			NA			NA		
L8S.	Central Artery: Btwn. Causeway On - and Callahan Off-Ramps	0.96	30	F	0.62	25	F	0.95	25	F	0.91	25	F	1.03	20	F	0.94	25	F
L9S.	Central Artery: Btwn. Storrow On - and Haymarket Off-Ramps	0.96	30	E	0.51	25	F	0.96	25	E	0.77	25	F	1.14	20	F	0.77	25	F
L10S.	Central Artery: Btwn. Tobin On - and Storrow Off-Ramps	1.20	20	F	0.81	25	F	0.88	25	F	0.74	25	F	1.14	20	F	0.75	30	F
L11S.	Mystic Tobin Bridge: North of I-93 Ramps	1.13	10	F	0.81	30	F	0.84	40	D	0.56	45	C	0.93	35	E	0.62	45	C
L12S.	I-93: North of Tobin Bridge Ramps	0.73	15	F	0.40	50	B	0.64	35	E	0.53	50	B	0.74	30	F	0.55	50	B
L13S.	Sumner Tunnel	1.17	20	F	0.98	20	F	1.28	20	F	1.04	20	F	1.37	20	F	1.21	20	F
L30S.	Central Artery: Btwn. Storrow On- and Callahan Off-Ramps	NA			NA			NA			NA			NA			NA		
L23S.	Fort Point Channel Tunnel: Btwn. Mass. Tpk. Off - and Herald Off-Ramps	NA			NA			NA			NA			NA			NA		
L31S.	Third Harbor Tunnel: Btwn. Congress On- and Mass. Tpk. Off-Ramps	NA			NA			NA			NA			NA			NA		
L14S.	Route 1A: Btwn. Airport On-Ramp and Sumner Toll Plaza	0.27	5	F	0.34	5	F	0.30	5	F	0.31	5	F	0.31	5	F	0.36	5	F
L25S.	Route 1A: Btwn. Airport/Third Harbor Off - and Airport On-Ramps	NA			NA			NA			NA			NA			NA		
L15S.	Route 1A: Btwn. Neptune On - and Airport Off-Ramps	0.31	45	A	0.28	45	A	0.26	45	A	0.18	45	A	0.26	45	A	0.20	45	A
L28S.	Route 1A: Btwn. Neptune On-Ramp & Off-Ramp to Airport & Third Harbor Tunnel	NA			NA			NA			NA			NA			NA		
L29S.	Connector: Route 1A to Third Harbor Tunnel and Airport	NA			NA			NA			NA			NA			NA		
L32S.	Airport Access Rdwy.: Btwn. Rte. 1A Ramps and Off-Ramp to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA		

PREFERRED ALTERNATIVE

	PREFERRED 1990 AM			PREFERRED 1990 PM			PREFERRED 2010 AM			PREFERRED 2010 PM		
	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS
MAJOR HIGHWAY LINKS - NORTHBOUND												
L1N.	1.38	20	F	0.88	35	E	1.40	20	F	0.93	35	[illegible]
L2N.	0.74	35	C	0.32	40	B	0.74	35	C	0.42	40	[illegible]
L33N.	1.01	30	F	0.70	35	D	1.26	30	F	0.70	35	[illegible]
L34N.	0.64	40	C	0.54	40	C	0.86	35	D	0.57	40	[illegible]
L32N.	0.68	30	E	0.68	30	E	0.77	30	E	0.68	30	[illegible]
L16N.	0.76	35	D	0.55	40	C	0.76	35	D	0.59	40	[illegible]
L19N.	0.40	40	C	0.62	40	C	0.72	40	C	0.73	40	[illegible]
L3N.	NA			NA			NA			NA		
L4N.	NA			NA			NA			NA		
L5N.	NA			NA			NA			NA		
L6N.	NA			NA			NA			NA		
L7N.	0.71	40	C	0.76	40	C	0.79	40	[illegible]	0.77	[illegible]	[illegible]
L8N.	0.37	50	A	0.62	45	B	0.37	50	A	[illegible]	[illegible]	[illegible]
L9N.	0.38	50	A	0.70	40	C	0.44	45	B	0.72	[illegible]	[illegible]
L10N.	0.59	35	C	0.74	35	C	0.76	35	C	0.85	35	[illegible]
L25N.	0.80	35	D	0.59	40	C	0.86	35	E	[illegible]	[illegible]	[illegible]
L26N.	0.78	40	C	0.76	35	D	0.83	35	D	0.76	35	[illegible]
L27N.	0.76	40	C	0.75	40	C	0.90	35	D	0.78	[illegible]	[illegible]
L28N.	0.67	40	C	0.68	40	C	0.72	40	C	0.73	35	[illegible]
L30N.	0.90	30	E	0.34	40	C	0.98	30	E	0.48	40	[illegible]
L31N.	0.62	40	C	0.45	40	C	0.72	35	D	0.55	40	[illegible]
L11N.	0.31	40	C	0.42	40	C	0.46	40	C	0.44	[illegible]	[illegible]
L24N.	0.16	35	C	0.28	35	C	0.17	35	C	0.32	[illegible]	[illegible]
L12N.	0.25	35	C	0.51	40	B	0.26	35	C	0.62	35	[illegible]
MAJOR HIGHWAY LINKS - EASTBOUND AND WESTBOUND												
L1E.	0.92	30	C	0.50	40	C	0.96	30	E	0.55	[illegible]	[illegible]
L1W.	0.56	55	B	0.74	50	C	0.61	55	[illegible]	0.78	[illegible]	[illegible]
L2E.	0.61	40	C	0.47	40	C	0.69	40	[illegible]	0.50	40	[illegible]
L2W.	0.58	40	C	0.71	35	D	0.72	35	[illegible]	0.76	[illegible]	[illegible]
MAJOR HIGHWAY LINKS - SOUTHBOUND												
L1S.	0.73	40	D	1.19	30	F	0.79	40	D	[illegible]	30	[illegible]
L2S.	0.67	40	D	1.12	25	F	0.73	30	F	[illegible]	25	[illegible]
L3S.	0.65	35	D	1.10	20	F	0.68	35	D	1.12	[illegible]	[illegible]
L4S.	NA			NA			NA			NA		
L16S.	0.61	45	C	1.05	30	F	0.63	45	C	1.05	30	[illegible]
L17S.	0.52	45	C	0.85	30	F	0.52	45	[illegible]	0.85	30	[illegible]
L5S.	NA			NA			NA			NA		
L18S.	0.41	45	C	0.53	35	E	0.41	45	C	0.59	[illegible]	[illegible]
L19S.	0.51	40	C	0.49	40	C	0.55	40	[illegible]	0.62	[illegible]	[illegible]
L20S.	0.45	40	C	0.40	40	C	0.45	40	C	[illegible]	[illegible]	[illegible]
L21S.	0.65	40	C	0.77	35	D	0.67	40	C	[illegible]	[illegible]	[illegible]
L33S.	0.54	40	C	0.84	35	E	0.56	40	C	0.84	[illegible]	[illegible]
L6S.	NA			NA			NA			NA		
L7S.	NA			NA			NA			NA		
L22S.	0.77	40	C	0.74	40	C	0.77	35	E	[illegible]	35	[illegible]
L8S.	NA			NA			NA			NA		
L9S.	NA			NA			NA			NA		
L10S.	0.69	35	E	0.62	40	C	0.95	30	F	[illegible]	[illegible]	[illegible]
L11S.	0.60	45	B	0.37	50	A	0.63	45	B	[illegible]	[illegible]	[illegible]
L12S.	0.55	40	C	0.49	40	C	0.71	30	[illegible]	0.53	[illegible]	[illegible]
L13S.	0.82	35	D	0.59	35	C	0.97	35	E	[illegible]	[illegible]	[illegible]
L30S.	0.63	40	C	0.64	40	C	0.76	40	[illegible]	0.69	[illegible]	[illegible]
L23S.	0.37	40	C	0.49	40	C	0.42	40	[illegible]	0.58	[illegible]	[illegible]
L31S.	0.33	40	C	0.45	40	C	0.35	40	[illegible]	[illegible]	[illegible]	[illegible]
L14S.	0.35	40	C	0.34	40	C	0.41	40	C	[illegible]	[illegible]	[illegible]
L25S.	0.27	40	C	0.23	40	C	0.27	[illegible]	C	[illegible]	[illegible]	[illegible]
L15S.	NA			NA			NA			NA		
L28S.	0.41	40	C	0.31	40	C	0.42	40	[illegible]	[illegible]	[illegible]	[illegible]
L29S.	0.54	40	C	0.37	40	C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L32S.	0.69	40	C	0.54	40	[illegible]	0.88	35	[illegible]	[illegible]	[illegible]	[illegible]

Table 31 (Cont'd.)
AM AND PM PEAK HOURS
VOLUME-TO-CAPACITY RATIO (V/C),
AND LEVELS OF SERVICE (LOS)
1982, 1990, 2010

		EXISTING						NO-BUILD ALTERNATIVE												PREFERRED ALTERNATIVE											
		1982						1990						2010						1990						2010					
		AM			PM			AM			PM			AM			PM			AM			PM			AM			PM		
MAJOR HIGHWAY RAMPS - NORTHBOUND		V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS	V/C	SP	LOS
R1N.	Columbia Rd. Off; from S.E. Expressway	0.34	35	C	0.17	35	C	0.38	35	C	0.20	35	C	0.46	35	C	0.22	35	C	0.36	35	C	0.10	40	C	0.46	35	C	0.10	40	C
R2N.	Mass. Avenue On; to S.E. Expressway	0.30	30	F	0.13	40	B	0.99	30	F	0.46	30	F	1.31	30	F	0.46	35	F	0.65	40	C	0.38	45	B	1.05	30	F	0.52	45	B
R13N.	Ramp: Frontage Rd. to Central Artery	NA			NA			NA			NA			NA			NA			0.73	25	E	0.58	30	C	0.73	25	E	0.62	30	C
R37N.	Ramp: Herald St. to Central Artery/Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.49	30	D	0.62	30	D	0.49	30	D	0.62	30	D
R3N.	Mass Tpk. On; to Central Artery	1.08	20	F	0.51	30	C	1.17	20	F	0.51	30	C	1.56	10	F	0.51	30	C	NA			NA			NA			NA		
R4N.	Atlantic Ave. Off; from Central Artery	1.58	15	F	1.03	20	F	2.00	10	F	1.40	15	F	2.00	5	F	1.40	15	F	NA			NA			NA			NA		
R5N.	Atlantic Ave. On; to Central Artery	0.16	25	F	0.53	15	F	0.61	25	F	0.66	15	F	0.61	20	F	0.76	15	F	0.67	35	C	1.16	20	F	0.73	35	C	1.16	20	F
R36N.	Atlantic Ave./Essex St. On; to Central Artery	NA			NA			NA			NA			NA			NA			0.46	35	C	0.87	25	E	0.50	35	C	0.87	25	E
R6N.	Callahan Tunnel Off; from Central Artery	0.86	25	F	0.47	20	F	0.81	25	E	0.90	20	F	0.86	20	F	0.99	15	F	NA			NA			NA			NA		
R7N.	Sumner Tunnel On; to Central Artery	0.91	30	E	0.87	30	E	1.00	15	F	0.98	15	F	1.37	10	F	0.98	15	F	0.90	20	E	0.77	20	E	1.27	15	F	0.93	20	E
R8N.	Storrow Drive Off; from Central Artery	0.62	35	C	0.37	40	C	0.59	35	C	0.55	40	C	0.80	25	E	0.56	40	C	0.65	35	C	0.75	25	E	0.88	25	E	0.81	25	E
R9N.	Storrow Drive On; to Central Artery	0.78	30	E	1.37	10	F	0.78	30	E	1.54	10	F	0.91	30	E	1.58	10	F	0.42	35	C	0.86	25	E	0.62	35	C	0.86	25	E
R24N.	Causeway St. On; to Central Artery	NA			NA			NA			NA			NA			NA			0.36	35	C	0.72	30	D	0.36	35	C	0.92	25	E
R25N.	Surface Artery Off; from Central Artery	NA			NA			NA			NA			NA			NA			0.76	25	E	0.66	35	C	0.79	25	E	0.66	35	C
R17N.	Ramp: Central Artery to Herald St./South Bay Connector	NA			NA			NA			NA			NA			NA			0.83	30	D	0.80	35	C	1.04	25	F	0.80	35	C
R38N.	W. Fourth St. On; to South Bay Connector	NA			NA			NA			NA			NA			NA			0.69	30	D	0.50	35	C	0.69	30	D	0.65	35	C
R27N.	Mass. Turnpike On; to Fort Point Channel Tunnel	NA			NA			NA			NA			NA			NA			0.43	35	D	0.20	40	C	0.46	35	D	0.22	40	C
R28N.	Connector: Central Artery to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.32	45	B	0.30	45	B	0.42	45	B	0.40	45	B
R31N.	Ramp: Third Harbor Tunnel to Congress St./S. Boston Access Rd.	NA			NA			NA			NA			NA			NA			0.58	45	B	0.15	50	A	0.59	45	B	0.15	50	A
R29N.	Congress St. Off; from Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.63	35	C	0.12	40	C	0.72	30	D	0.17	40	C
R30N.	Congress St. On; to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.12	40	C	0.28	40	C	0.17	40	C	0.28	40	C
R32N.	South Boston Access Road	NA			NA			NA			NA			NA			NA			0.62	40	C	0.20	50	A	0.62	40	C	0.20	50	A
R33N.	Ramp: South Boston Access Road to Summer St.	NA			NA			NA			NA			NA			NA			0.43	35	C	0.13	40	C	0.43	35	C	0.15	40	C
R34N.	Ramp: South Boston Access Road to Northern Ave.	NA			NA			NA			NA			NA			NA			0.20	40	C	0.05	40	C	0.20	40	C	0.06	40	C
R10N.	Airport Off; from Route 1A	0.87	30	E	0.79	30	E	1.07	25	F	1.14	25	F	1.33	20	F	1.30	20	F	0.74	30	D	0.73	35	C	1.14	25	F	0.92	30	E
R11N.	Airport On; to Route 1A	0.17	40	B	0.57	40	B	0.28	40	B	0.59	35	C	0.36	40	B	0.76	30	D	NA			NA			NA			NA		
R20N.	Ramp: Third Harbor Tunnel to Airport	NA			NA			NA			NA			NA			NA			0.38	35	C	0.21	35	C	0.51	35	C	0.27	35	C
R21N.	Ramp: Third Harbor Tunnel to Route 1A	NA			NA			NA			NA			NA			NA			0.37	35	C	0.65	35	C	0.39	35	C	0.76	30	E
R22N.	Airport/Third Harbor Tunnel On; to Route 1A	NA			NA			NA			NA			NA			NA			0.39	45	B	0.82	40	C	0.40	45	B	1.08	30	F
R35N.	Ramp: Third Harbor Tunnel to Bird Island Flats.	NA			NA			NA			NA			NA			NA			0.13	40	C	0.46	35	C	0.27	35	C	0.59	35	C

MAJOR HIGHWAY RAMPS - SOUTHBOUND																															
R1S.	Columbia Rd. On; to S.E. Expressway	0.27	35	C	1.28	25	F	0.27	35	C	1.33	25	F	0.32	35	C	1.38	20	F	0.10	40	C	0.54	25	F	0.13	40	C	0.55	25	F
R2S.	Mass. Ave. Off; from S.E. Expressway	0.23	40	B	0.16	45	A	0.23	40	B	0.20	40	B	0.27	40	B	0.23	40	B	0.22	50	A	0.42	50	A	0.22	50	A	0.42	50	A
R3S.	Albany St. On; to S.E. Expressway	0.40	30	C	1.25	20	F	0.33	30	C	1.51	20	F	0.33	30	C	1.51	20	F	1.03	25	F	1.69	15	F	1.11	25	F	1.84	15	F
R13S.	Ramp: Fort Point Channel Tunnel to S.E. Expressway	NA			NA			NA			NA			NA			NA			0.66	30	D	0.80	25	E	0.73	25	E	0.90	25	E
R30S.	Ramp: Fort Point Channel Tunnel to Herald St.	NA			NA			NA			NA			NA			NA			0.08	40	C	0.22	35	C	0.10	40	C	0.32	35	C
R15S.	Ramp: Fort Point Channel Tunnel to Mass. Tpk.	NA			NA			NA			NA			NA			NA			0.33	40	C	0.49	40	C	0.33	40	C	0.55	40	C
R4S.	Mass. Tpk./Albany St. Off; from Central Artery	0.85	25	E	0.88	25	E	0.85	25	E	0.95	20	B	1.02	15	F	1.13	15	F	0.52	35	C	0.74	30	F	0.56	35	C	0.75	30	E
R17S.	Ramp: Mass. Tpk./Kneeland St. to Central Artery	NA			NA			NA			NA			NA			NA			0.41	35	C	0.65	25	F	0.49	35	C	0.85	25	F
R31S.	Surface Artery/Essex St. On; to Central Artery	NA			NA			NA			NA			NA			NA			0.41	35	C	1.19	25	F	0.41	35	C	1.19	25	F
R5S.	Dewey Sq. Off; from Central Artery	0.50	30	C	0.32	30	C	0.49	30	C	0.34	30	C	0.56	30	C	0.34	30	C	0.69	30	C	0.44	30	C	0.69	30	C	0.44	30	C
R6S.	High St. Off; from Central Artery	0.87	20	E	0.36	30	C	0.74	20	E	0.36	30	C	0.89	20	E	0.36	30	C	NA			NA			NA			NA		
R18S.	Purchase St. On; to Central Artery	NA			NA			NA			NA			NA			NA			0.44	35	C	0.66	25	E	0.44	35	C	0.73	25	E
R19S.	Ramp: Central Artery to Purchase St.	NA			NA			NA			NA			NA			NA			0.89	25	E	0.65	35	C	0.89	25	E	0.65	35	C
R7S.	Haymarket On; to Central Artery	1.01	15	F	1.20	15	F	1.13	15	F	1.12	15	F	1.32	10	F	1.12	15	F	1.00	25	F	1.16	20	F	1.00	25	F	1.20	20	F
R8S.	Callahan Tunnel Off; from Central Artery	0.41	15	F	0.57	15	F	0.49	15	F	0.46	15	F	0.62	15	F	0.48	15	F	0.62	30	C	0.77	30	D	0.86	25	E	0.93	25	E
R9S.	Storrow Drive On; to Central Artery	0.98	20	F	0.57	30	C	1.34	20	F	0.75	25	E	1.39	20	F	0.77	25	E	1.48	20	F	1.14	20	F	1.48	20	F	1.34	20	F
R10S.	Storrow Drive Off; from Central Artery	1.12	20	F	1.22	20	F	1.06	20	F	1.25	20	F	1.39	20	F	1.29	20	F	NA			NA			NA			NA		
R24S.	Storrow Drive/Causeway St. Off; from Central Artery	NA			NA			NA			NA			NA			NA			0.91	30	E	0.61	35	C	1.28	25	F	0.66	35	C
R25S.	Congress St. Off; from Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.30	25	D	0.23	25	D	0.30	25	D	0.26	25	D
R27S.	Summer St./Northern Ave. On; to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.14	40	C	0.35	35	C	0.14	40	C	0.37	35	C
R26S.	Congress St. On; to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.14	40	C	0.35	35	C	0.14	40	C	0.37	35	C
R11S.	Airport Off; from Route 1A	0.47	35	B	0.33	40	A	0.54	30	C	0.42	35	B	0.63	30	C	0.53	30	C	NA			NA			NA			NA		
R12S.	Airport On; to Route 1A	0.34	30	C	0.55	25	F	0.69	30	C	0.91	20	F	0.87	25	E	1.17	15	F	0.59	30	C	0.67	30	C	0.81	25	E	0.88	25	E
R21S.	Ramp: Airport to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.37	35	C	0.65	35	C	0.40	35	C	0.75	25	E
R28S.	Ramp: Bird Island Flats to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.04	40	C	0.10	40	C	0.39	35	C	0.11	40	C
R29S.	Ramp: Airport Access Road to Third Harbor Tunnel	NA			NA			NA			NA			NA			NA			0.72	30	D	0.35	35	C	0.76	25	E	0.52	35	C

Table 31 (Cont'd.)
AM AND PM PEAK HOURS
VOLUME-TO-CAPACITY RATIO (V/C),
AND LEVELS OF SERVICE (LOS)
1982, 1990, 2010

	INTERSECTIONS	EXISTING				NO-BUILD ALTERNATIVE								PREFFERRED ALTERNATIVE							
		1982				1990				2010				1990				2010			
		AM		PM		AM		PM		AM		PM		AM		PM		AM		PM	
		V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
	South Boston																				
1.	Columbia Circle	0.85	D	0.52	A	0.95	E	0.65	B	0.95	E	0.76	C	0.95	E	0.72	C	0.92	E	0.78	C
2.	Andrew Square*	1.02	F	0.84	D	1.63	F	1.53	F	1.65	F	1.63	F	1.48	F	1.45	F	1.49	F	1.47	F
3.	Columbia Rd./Day Blvd./L St.	0.25	C	1.05	F	2.00	F	1.27	F	2.00	F	1.39	F	0.57	D	1.24	F	0.58	D	1.30	F
4.	L St./East First St./Summer St.*	0.86	D	0.76	C	0.92	E	0.86	D	0.93	E	0.90	D	0.93	E	0.86	D	0.95	E	0.91	E
5.	Dorchester Ave./W. 5th St./A St.*	0.53	A	0.65	B	0.55	A	0.69	B	0.56	A	0.81	D	0.60	B	0.71	C	0.63	B	0.74	C
6.	Dorchester Ave./W. 4th St.*	0.58	A	0.50	A	0.50	A	0.52	A	0.52	A	0.58	A	0.82	D	0.78	C	0.79	D	0.90	D
7.	Dorchester Ave./W. Broadway (Herald St. Ext.)*	0.87	D	1.07	F	0.92	E	0.86	D	0.96	E	0.95	E	0.69	B	0.37	A	0.72	C	0.39	A
8.	Summer St./Dorchester Ave.*	0.78	C	0.76	C	0.99	E	1.46	F	0.99	E	1.44	F	0.98	E	0.91	E	1.05	F	0.91	E
9.	Summer St./Melcher St.*	0.44	A	0.48	A	0.53	A	0.69	B	0.53	A	0.67	B	0.56	A	0.76	C	0.61	B	0.78	C
10.	Summer St./D St.*	0.73	C	0.69	B	0.78	C	0.75	C	0.60	C	0.76	C	0.45	A	0.70	C	0.47	A	0.71	C
11.	Congress St./Dorchester Ave.	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	0.74	C	0.96	E	0.82	D	1.02	F
12.	Congress St./A St.	0.88	E	1.25	F	1.47	F	2.00	F	1.47	F	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F
13.	Northern Ave./Sleeper St.	1.30	F	2.00	F	2.00	F	2.00	F	1.91	F	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F
14.	Herald St./Herald St. Ext./Albany St.*	0.84	D	0.80	C	1.07	F	0.90	E	1.13	F	0.94	E	0.97	E	1.25	F	1.17	F	1.39	F
15.	Berkeley St./W. Fourth St./Frontage Rd./Albany St.*	1.03	F	0.76	C	1.07	F	0.77	C	1.11	F	0.80	C	0.95	E	0.65	B	0.84	E	0.75	C
61.	Congress St./Third Harbor Tunnel Ramps (Assumed *)	NA		NA		NA		NA		NA		NA		0.60	A	0.53	A	0.72	C	0.60	B
62.	Northern Ave./Third Harbor Tunnel Ramps Ext. (Assumed *)	NA		NA		NA		NA		NA		NA		0.42	A	0.48	A	0.42	A	0.48	A
63.	Northern Ave./Third Harbor Tunnel Ramps at General Ship (Assumed *)	NA		NA		NA		NA		NA		NA		0.61	B	0.47	A	0.59	B	0.50	A
64.	Summer St./Third Harbor Tunnel Ramps (Assumed *)	NA		NA		NA		NA		NA		NA		0.68	B	0.48	A	0.72	C	0.48	A
65.	Herald St. Ext./Relocated Dorchester Ave./Expressway Off-Ramp (Assumed*)	NA		NA		NA		NA		NA		NA		1.32	F	0.62	B	1.52	F	0.73	C
	East Boston and Revere																				
16.	Sumner St./Meridian St./Chelsea St.*	0.26	A	0.34	A	0.44	A	0.46	A	0.44	A	0.46	A	0.31	A	0.44	A	0.36	A	0.46	A
17.	Sumner St./Bremen St.	0.08	B	0.12	B	0.22	B	0.12	B	0.14	B	0.12	B	0.20	B	0.12	B	0.15	B	0.12	B
18.	Maverick St./Meridian St./Chelsea St.	0.52	C	0.44	B	0.52	C	0.63	D	0.51	C	0.69	D	0.69	D	0.57	C	0.51	D	0.57	C
19.	Maverick St./Bremen St.	0.21	A	0.15	A	0.20	A	0.17	B	0.20	A	0.17	B	0.13	B	0.17	B	0.21	B	0.15	B
20.	Maverick St./Jeffries St./Airport Access Rd.	0.26	A	0.15	A	0.26	A	0.14	A	0.26	A	0.14	A	0.19	A	0.14	A	0.26	A	0.15	A
21.	Porter St./Chelsea St./Visconti Rd.*	0.83	D	0.65	B	0.93	E	0.88	D	1.27	F	1.01	F	0.66	B	0.34	A	0.59	B	0.54	A
22.	Porter St./Bremen St.	0.52	D	0.75	E	0.94	E	0.73	E	1.09	F	1.04	F	0.79	E	0.42	C	0.87	E	0.93	E
23.	Porter St./Orleans St.	0.11	A	0.22	C	0.27	D	0.20	D	0.27	D	0.28	D	0.16	A	0.13	B	0.10	A	0.25	D
24.	Porter St./Cottage St	0.34	A	0.32	A	0.49	A	0.52	A	0.64	B	0.62	B	0.34	A	0.30	A	0.47	A	0.42	A
25.	Central Square (Meridian St./Saratoga St.)*	0.42	A	0.36	A	0.46	A	0.44	A	0.57	A	0.54	A	0.46	A	0.41	A	0.66	B	0.38	A
26.	Porter St./London St.	1.05	F	0.37	C	1.22	F	0.60	D	1.30	F	0.99	E	0.46	C	0.16	A	0.63	C	0.17	A
27.	Bennington St./Prescott St.	0.23	D	0.14	D	NO DATA AVAILABLE								NO DATA AVAILABLE							
28.	Chelsea St./East Eagle St.	0.18	C	0.26	C	0.22	D	0.12	A	0.28	D	0.14	A	0.27	D	0.25	C	0.33	D	0.35	C
29.	Bennington St./Neptune Rd.	0.68	B	0.62	B	NO DATA AVAILABLE								NO DATA AVAILABLE							
30.	McClellan Off-Ramp/Neptune Rd.	0.55	C	1.27	F	0.38	C	1.04	F	0.56	D	0.96	F	0.83	E	1.01	F	0.83	E	1.07	F
31.	Condor St./Meridian St.*	0.50	A	0.63	B	0.60	A	0.71	C	0.69	B	0.78	C	0.58	A	0.68	B	0.69	B	0.76	C
32.	Airport Crossover Roads*	0.64	B	0.95	E	0.77	C	0.81	D	0.94	E	0.99	E	NA		NA		NA		NA	
33.	Bell Circle (Revere)*	1.15	F	0.89	D	1.33	F	1.20	F	1.37	F	1.24	F	1.40	F	1.26	F	1.45	F	1.41	F
66.	Connector Rd./Airport Crossover Rd. (Assumed *)	NA		NA		NA		NA		NA		NA		0.64	B	0.51	A	0.83	D	0.59	A
67.	Service Rd./Airport Crossover Rd.	NA		NA		NA		NA		NA		NA		0.44	B	0.67	C	0.78	C	1.18	D
68.	American Airline Frontage Rd./Airport Egress Rd.	NA		NA		NA		NA		NA		NA		0.47	C	1.45	F	0.84	E	2.00	F
	Downtown Boston and Charlestown																				
34.	Kneeland St./Surface Artery/S.B. On-Ramp*	0.69	B	0.86	D	1.04	F	0.71	C	0.97	F	0.90	E	0.38	A	0.55	A	0.37	A	0.59	A
35.	Dewey Sq.*	0.57	F	0.73	F	2.00	F	1.34	F	1.73	F	1.77	F	0.64	B	0.67	B	0.67	B	0.58	B
36.	Atlantic Ave./Congress St.*	0.94	E	0.84	D	1.54	F	1.24	F	1.36	F	1.33	F	0.79	C	0.65	B	0.81	D	0.65	B
37.	Atlantic Ave./Northern Ave.*	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	0.59	A	0.79	C	0.60	B	0.80	C
38.	Atlantic Ave./Surface Artery/High St.*	0.89	D	0.80	C	1.42	F	0.93	F	1.42	F	0.81	F	0.19	A	0.35	A	0.23	A	0.37	A
39.	Purchase St./Congress St.*	0.65	B	0.82	D	0.64	B	0.72	C	0.68	B	0.77	D	0.39	A	1.18	F	0.42	A	1.13	F
40.	North St./Blackstone St./S.B. Off-Ramp (Assumed *)	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	0.91	E	0.65	B	1.12	F	0.73	C
41.	Cross St./Hanover St./Salem St. (Assumed *)	1.89	F	2.00	F	2.00	F	2.00	F	2.00	F	2.00	F	0.65	B	0.52	A	0.79	C	0.59	A
42.	Leverett Circle*	0.96	E	0.75	C	1.09	F	0.92	E	0.99	F	0.80	E	0.92	E	0.76	C	0.87	E	0.80	D
45.	Congress St./North St.*	0.54	A	0.71	C	0.68	B	0.85	D	0.89	D	0.70	D	0.58	A	0.33	A	0.63	B	0.38	A
46.	City Square (Charlestown)*	0.81	D	1.20	F	1.08	F	1.26	F	1.06	F	1.28	F	1.03	F	1.45	F	1.22	F	1.13	F
47.	Causeway St./North Washington St./Commercial St.*	0.77	C	1.00	E	1.12	F	1.37	F	1.01	F	1.43	F	0.86	D	1.04	F	0.67	D	1.13	F
48.	Causeway St./Lomasney Way/Merrimac St./Staniford St. (Assumed *)	2.00	F	2.00	F	0.81	D	0.91	E	0.76	D	0.85	E	0.83	D	0.87	D	0.85	D	0.89	D
49.	New Chardon St./Merrimac St.*	0.65	B	0.44	A	0.65	B	0.44	A	0.65	B	0.63	B	0.58	A	0.38	A	0.75	C	0.42	A
50.	New Chardon St./North Washington St.*	0.82	D	0.58	F	0.88	D	0.69	F	0.82	D	0.71	F	2.00	F	1.91	F	1.78	F	2.00	F
51.	Sudbury St./Congress St./Merrimac St.*	0.29	A	0.54	F	0.52	A	0.57	F	0.49	A	0.60	F	0.62	B	0.73	C	0.75	C	0.75	C
52.	Surface Artery/Hanover St.	NA		NA		NA		NA		NA		NA		2.00	F	2.00	F	2.00	F	2.00	F
53.	Commercial St./Hanover St.	0.63	E	0.53	E	0.93	E	0.20	C	0.51	E	0.40	C	0.23	B	0.22	C	0.24	B	0.20	C
54.	State St./Atlantic Ave.*	0.39	A	0.47	A	0.74	C	0.71	C	0.65	C	0.68	C	0.16	A	0.36	A	0.17	A	0.38	A
55.	State St./Surface Artery*	0.51	A	0.67	B	0.99	E	0.85	D	0.71	E	0.91	E	0.55	A	0.32	A	0.50	A	0.33	A
56.	Sudbury St./Blackstone St./S.B. On-Ramp*	0.75	C	0.26	F	0.85	D	0.40	F	0.85	D	0.45	F	1.65	F	1.39	F	1.33	F	1.40	F
57.	Causeway St./S.B. Off-Ramp (Assumed *)	NA		NA		NA		NA		NA		NA		0.99	E	0.94	E	1.22	F	0.99	E
58.	North Washington St. (S.B. Roadway)/S.B. Off-Ramp Ext. (Assumed *)	NA		NA		NA		NA		NA		NA		0.92	E	0.68	B	0.75	E	0.70	C
59.	North Washington St. (S.B. Roadway)/N.B. On-Ramp Ext. (Assumed *)	NA		NA		NA		NA		NA		NA		0.91	E	0.76	C	1.04	F	0.84	D
60.	Causeway St./N.B. On-Ramp (Assumed *)	NA		NA		NA		NA		NA		NA		0.63	B	0.90	D	0.53	B	1.05	F

Table 32

LEVEL OF SERVICE TOTALS
REGIONAL HIGHWAY NETWORK*

1990 AM PEAK

Level of Service	1982		No-Build Alt.		Preferred Alternative Exist. Rdwys.		Preferred Alternative Proj. Rdwys.	
A-D	24	(44)	23	(42)	30	(84)	52	(87)
E	9	(17)	8	(15)	4	(11)	5	(8)
F	21	(39)	23	(43)	2	(6)	3	(5)
TOTAL	54	(100)	54	(100)	36	(100)	60	(100)

1990 PM PEAK

Level of Service	1982		No-Build Alt.		Preferred Alternative Exist. Rdwys.		Preferred Alternative Proj. Rdwys.	
A-D	22	(41)	21	(39)	23	(64)	50	(83)
E	4	(7)	2	(4)	5	(14)	6	(10)
F	28	(52)	31	(57)	8	(22)	4	(7)
TOTAL	54	(100)	54	(100)	36	(100)	60	(100)

2010 AM PEAK

Level of Service	1982		No-Build Alt.		Preferred Alternative Exist. Rdwys.		Preferred Alternative Proj. Rdwys.	
A-D	24	(44)	19	(35)	22	(61)	47	(79)
E	9	(17)	6	(11)	6	(17)	8	(13)
F	21	(39)	29	(54)	8	(22)	5	(8)
TOTAL	54	(100)	54	(100)	36	(100)	60	(100)

2010 PM PEAK

Level of Service	1982		No-Build Alt.		Preferred Alternative Exist. Rdwys.		Preferred Alternative Proj. Rdwys.	
A-D	22	(41)	19	(35)	20	(56)	46	(77)
E	4	(7)	3	(6)	8	(22)	9	(15)
F	28	(52)	32	(59)	8	(22)	5	(8)
TOTAL	54	(100)	54	(100)	36	(100)	60	(100)

* xx = No. of intersections in the category; (xx) = % of intersections in the category.

As summarized in Table 33, without the project, 2010 AM and PM peak hour levels of service and v/c's will remain the same or degrade further on the selected highway links, as traffic increases. The one exception will be the Mystic-Tobin Bridge. Its AM peak hour level of service will improve from LOS F to LOS E due to the MDPW's Central Artery North Area Project.

In 2010 with the No-Build Alternative, both the Callahan and Sumner Tunnels will operate at LOS F during the AM and PM peak hours. The Preferred Alternative will improve this operation to LOS D or better in the Callahan Tunnel during both peak hours; in the Sumner Tunnel, AM peak operations will improve to LOS E; PM peak operations to LOS C.

On the Central Artery/Southeast Expressway, in both the 2010 AM and PM peak hours, current LOS E or LOS F conditions will still prevail with the No-Build Alternative, but with higher v/c ratios and more traffic diversions to parallel roadways.

With the Preferred Alternative, Central Artery operations will improve generally to LOS C or LOS D in the peak hours by 2010. A few locations will still experience LOS E operations during the peak hours, but the duration of congestion at these locations will be reduced considerably compared to the No-Build Alternative.

As an indication of the increased congestion expected on the major study area facilities, an estimate of the number of congested hours of operation (LOS E or LOS F) has been made for the No-Build Alternative in 2010, and is presented in Table 34; also presented in Table 34 are similar estimates of congested hours of operation with the Preferred Alternative. With the exception of the Southeast Expressway (which is not being improved with this project), in 2010, the Preferred Alternative substantially reduces the hours of congested operations on major highways in the project area.

<u>South Boston Intersections V/C's and LOS</u>

A summary tabulation of the South Boston study area intersections by level of service values, is contained in Table 35. This tabulation was prepared from Table 31.

<u>Without the project</u>, South Boston intersections as a whole will suffer degradation in level of service and V/C's between 1982 and 2010 during both peaks. Several intersections paralleling the Southeast Expressway will carry "short-cutting" peak period traffic trying to avoid congestion on the Expressway/Artery by diverting to local streets.

<u>The Preferred Alternative</u>, during 1990 and 2010 peak hours, will improve overall LOS operations at selected South Boston intersections with few exceptions. During peak hours, particularly the morning peak hour, the Preferred Alternative diverts substantial amounts of truck and automobile "through" traffic from South Boston local streets to the Southeast Expressway/Central Artery (as pointed out in the previous subsection on <u>Peak Hour Traffic Volumes</u>). This traffic would otherwise be short-cutting on local streets to avoid congestion on the Central Artery. Increased congestion on the Southeast Expressway may continue to cause some traffic to divert to local streets in an effort to avoid this congestion.

<u>East Boston and Revere Intersections V/C and LOS</u>

A summary tabulation of the East Boston and Bell Circle (Revere) study area intersections, by level of service values, is contained in Table 36. This summary table was prepared from Table 31.

From Table 36, overall levels of service and v/c's without project improvements will degrade between 1982 and 2010 during both peak hours. This new traffic, primarily related to airport growth, is expected to spill

Table 33

REGIONAL HIGHWAY NETWORK LEVEL OF SERVICE SUMMARY
PREFERRED VS. NO-BUILD ALTERNATIVES

	1982		2010			
	Existing		No-Build Alt		Pref. Alt.	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
ed Highway Links ional Level of e - Worst Case						
tate Route 93	F	C	F	C	F	C
-Tobin Bridge	F	C	E	E	B	B
w Drive, W. of Copley Sq.	C	C	C	C	D	D
l Artery, No. of Tunnels	E-F	E-F	E-F	E-F	D	C
an Tunnel	D	F	F	F	C	D
Tunnel	E	F	F	F	E	C
l Artery, So. of Tunnels	E-F	F	F	F	E	D
Harbor Tunnel	-	-	-	-	C	C
husetts Turnpike	D	B	E	C	E	C
ast Expressway	F	E-F	F	F	F	F
lA, No. of Airport	A	A	A	A-B	C	C
ed Highway Ramps						
ic Ave. On-Ramp ntral Artery NB	F	F	F	F	C	E
an Tunnel Off-Ramp Central Artery NB	F	F	F	F	-	-
w Drive Off-Ramp Central Artery NB	C	C	E	C	E*	E*
w Drive Off-Ramp Central Artery SB	F	F	F	F	F	C
an Tunnel Off-Ramp Central Artery SB	F	F	F	F	E	E

np to Storrow Drive and Causeway Street.

Table 34

NUMBER OF HOURS OF CONGESTED OPERATION[a]

ROADWAY	1982 Existing	2010 No-Build Alternative	2010 Preferred Alternative
Sumner Tunnel	5	14	1
Callahan Tunnel	5	14	0
Third Harbor Tunnel (Inbnd)	-	NA	0
Third Harbor Tunnel (Outbnd)	-	NA	0
Mystic-Tobin Bridge (Inbnd)	1	1	0
Mystic-Tobin Bridge (Outbnd)	0	0	0
Interstate I-93[2] (Inbnd)	0	0	0
Interstate I-93 (Outbnd)	0	0	0
S.E. Xway @ Southampton St (Inbnd)	4	9	10
S.E. Xway @ Southampton St (Outbnd)	4	13	16
Mass. Tpk.[b] (Inbnd)	0	0	1
Mass. Tpk. (Outbnd)	0	0	0
Artery, No. of Tunnels (NB)	8	12	2
Artery, No. of Tunnels (SB)	4	8	2
Artery, So. of Tunnels (NB) [c]	5	13	2
Artery, So. of Tunnels (SB) [c]	5	12	2
Storrow Dr., W. of Copley Sq. (Inbnd)	2	2	2
Storrow Dr., W. of Copley Sq. (Outbnd)	0	0	0
Route 1A, No. of Airport (Inbnd) [c]	0	0	0
Route 1A, No. of Airport (Outbnd)	0	0	0
High-Level Bridge (Inbnd)	4	5	0
High-Level Bridge (Outbnd)	8	6	0

a LOS E or F

b Beyond influence of Xway/Artery

c Beyond influence of downstream congestion

Table 35

LEVEL OF SERVICE COMPARISONS
SOUTH BOSTON INTERSECTIONS*

Level of Service	1982 AM PEAK Existing		1990 AM PEAK No-Build		Pref. Alt.	
A-D	10	(67)	4	(26)	11	(55)
E	1	(7)	4	(27)	5	(25)
F	4	(26)	7	(47)	4	(20)
TOTAL	15	(100)	15	(100)	20	(100)

Level of Service	1982 PM PEAK Existing		1990 PM PEAK No-Build		Pref. Alt.	
A-D	10	(67)	8	(53)	13	(65)
E	0	(0)	1	(7)	2	(10)
F	5	(33)	6	(40)	5	(25)
TOTAL	15	(100)	15	(100)	20	(100)

Level of Service	1982 AM PEAK Existing		2010 AM PEAK No-Build		Pref. Alt.	
A-D	10	(67)	4	(26)	11	(55)
E	1	(7)	4	(27)	3	(15)
F	4	(26)	7	(47)	6	(30)
TOTAL	15	(100)	15	(100)	20	(100)

Level of Service	1982 PM PEAK Existing		2010 PM PEAK No-Build		Pref. Alt.	
A-D	10	(67)	7	(47)	12	(60)
E	0	(0)	2	(13)	2	(10)
F	5	(33)	6	(40)	6	(30)
TOTAL	15	(100)	15	(100)	20	(100)

* xx = No. of intersections in the category; (xx) = % of intersections in the category.

over onto local streets in East Boston.

Bell Circle in Revere will continue to operate at LOS F with the Preferred Alternative, but congestion will last longer due to its higher v/c ratio.

The Preferred Alternative will produce an overall improvement in LOS at selected East Boston and Revere intersections. Much of this improvement results from the removal of through traffic from the local streets of East Boston which would otherwise be taking short-cuts to the Sumner Tunnel, from the Callahan Tunnel, and to and from Logan Airport. This traffic is diverted back onto Route 1A and the main Logan Airport access roads.

Downtown Boston Intersections V/C's and LOS

Level of service values for study area intersections in downtown Boston are contained in Table 37. This tabulation was prepared from Table 31.

From Table 37, without the project, selected intersections in downtown Boston will experience an overall degradation in level of service and v/c's between 1982 and 2010 during both peak hours, as traffic increases in the downtown Boston area.

In 2010, the Preferred Alternative reduces the percentage of selected intersections operating at LOS F during both AM and PM peak hours.

In addition, Leverett Circle operates at an improved LOS relative to the No-Build Alternative. In the 2010 AM peak hour, an improvement from LOS F to LOS E is realized, while the improvement in the PM peak is from LOS F to LOS D.

4.2.4 Central Artery Bottlenecks and Congestion Points

Without the Project

Existing and future Central Artery/Southeast Expressway bottlenecks and congestion points with the No-Build Alternative were discussed in Section 3.1.

The Preferred Alternative vs. the No-Build Alternative

Table 38 lists the individual queue lengths, in miles, for the Preferred Alternative and the No-Build Alternative at each major congestion point along the Central Artery and Southeast Expressway between the High-Level Bridge and Columbia Circle for 1990 and 2010 AM and PM peak hours as well as by direction (northbound and southbound).

As Table 38 indicates, bottlenecks and congestion points differ considerably by direction and peak hour. Each individual queue length represents a calculated build-up of vehicles behind a congestion point. The calculations for queue lengths were based on the geometric roadway configuration, number of lanes, anticipated traffic volumes, lengths of traffic weaving sections, and ramp locations. While these individual queues are not additive where they overlap, overall queue formations develop due to the interaction of various congestion points, with the longest queue prevailing. However, obtaining information about the individual congestion point queues is also critical to the analysis of build alternatives. It not only provides a basis for comparing the overall effectiveness of each alternative at reducing individual queues, but is required for optimizing a highway design under the situation where secondary queues would remain after a primary queue source is mitigated (e.g., elimination of the High-Level Bridge bottleneck, the primary queue source on the Central Artery).

This section discusses and compares individual queues and congestion points for the Preferred and the No-Build Alternatives in 1990 and 2010

Table 36

LEVEL OF SERVICE COMPARISONS
EAST BOSTON/REVERE INTERSECTIONS (INCL. BELL CIRCLE)*

	1982 AM PEAK		1990 AM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	16	(89)	12	(75)	15	(83)
E	0	(0)	2	(13)	2	(11)
F	2	(11)	2	(12)	1	(6)
TOTAL	18	(100)	16	(100)	18	(100)

	1982 PM PEAK		1990 PM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	15	(83)	13	(81)	15	(83)
E	2	(11)	1	(6)	0	(0)
F	1	(6)	2	(13)	3	(17)
TOTAL	18	(100)	16	(100)	18	(100)

	1982 AM PEAK		2010 AM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	16	(89)	11	(69)	14	(77)
E	0	(0)	1	(6)	3	(17)
F	2	(11)	4	(25)	1	(6)
TOTAL	18	(100)	16	(100)	18	(100)

	1982 PM PEAK		2010 PM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	15	(83)	10	(62)	14	(77)
E	2	(11)	2	(13)	1	(6)
F	1	(6)	4	(25)	3	(17)
TOTAL	18	(100)	16	(100)	18	(100)

* xx = No. of intersections in the category; (xx) = % of intersections in the category.

Table 37

LEVEL OF SERVICE COMPARISONS
DOWNTOWN BOSTON INTERSECTIONS*

	1982 AM PEAK		1990 AM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	12	(60)	8	(40)	16	(64)
E	3	(15)	2	(10)	5	(20)
F	5	(25)	10	(50)	4	(16)
TOTAL	20	(100)	20	(100)	25	(100)

	1982 PM PEAK		1990 PM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	9	(45)	7	(35)	18	(72)
E	2	(10)	2	(10)	1	(4)
F	9	(45)	11	(55)	6	(24)
TOTAL	20	(100)	20	(100)	25	(100)

	1982 AM PEAK		2010 AM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	12	(60)	8	(40)	16	(64)
E	3	(15)	2	(10)	2	(8)
F	5	(25)	10	(50)	7	(28)
TOTAL	20	(100)	20	(100)	25	(100)

	1982 PM PEAK		2010 PM PEAK			
Level of Service	Existing		No-Build		Pref. Alt.	
A-D	9	(45)	5	(25)	17	(68)
E	2	(10)	4	(20)	1	(4)
F	9	(45)	11	(55)	7	(28)
TOTAL	20	(100)	20	(100)	25	(100)

* xx = No. of intersections in the category; (xx) = % of intersections in the category.

Table 38

INDIVIDUAL QUEUE LENGTH COMPARISONS BY ALTERNATIVE*

way/Artery ource	1990 QUEUES (in miles) AM No-Build		PM No-Build		2010 QUEUES (in miles) AM No-Build		PM No-Build	
	AM No-Build	AM Pref. Alt.	PM No-Build	PM Pref. Alt.	AM No-Build	AM Pref. Alt.	PM No-Build	PM Pref. Alt.
ound								
bia Rd. On-Ramp	0.5	0.6	0	0	0.5	0.6	0	0
Ave. On-Ramp	1.0	0	0	0	1.3	0	0	0
Pike Off-Ramp	0.9	1.2	0	0	0.9	1.2	0.1	0
Pike On-Ramp	0.9	0	0	0	1.2	0	0.1	0
ern Ave. or lantic Ave. On-Ramp	0.5	0	0.8	0	0.8	0	0.9	0
han Tunnel Off-Ramp**	0	0	0.5	0	0.1	0	0.7	0
row Drive Off-Ramp	0	0	0	0	0	0	0	0
Level Bridge (I-93)	0	0	1.9	0	0	0	2.0	0
Bound								
-Level Bridge (I-93)	1.4	0	0	0	3.2	0	0	0
row Dr. Ramps	0	0	0	0	0.3	0.7	0	0
ahan Tunnel/ ymarket Off-Ramp	0.3	0	0.3	0	0.3	0	0.3	0
arket On-Ramp	0.6	0	0.5	0	0.8	0	0.5	0.1
hase/Congress -Ramp	0	0	0.5	0	0	0	0.6	0
. Pike On-Ramp	0	0	1.5	0.2	0	0	1.5	0.2
ny St. On-Ramp	0	0	0.6	0.6	0	0	0.6	0.6
. Ave. On-Ramp	0	0	0.5	0.6	0	0	0.5	0.9
mbia Rd. On-Ramp	0	0	0.1	0.1	0	0	0.1	0.2

s are not additive where overlaps occur. See text for further explanation.

r the Preferred Alternative, this ramp exits to the Surface Artery.

Year 1990

Northbound in the AM peak hour, the only source of congestion with the Preferred Alternative is the Columbia Road on-ramp which creates a 0.6 mile queue on the Southeast Expressway. The No-Build Alternative generates a similar 0.5 mile queue at this location. In addition, the No-Build Alternative generates queues at both Massachusetts Turnpike on- and off-ramps (0.9 miles each), as well as a 1.0 mile queue at the Massachusetts Avenue on-ramp, and a half mile queue at the Northern Avenue or Atlantic Avenue on-ramp.

Northbound in the PM peak hour, the Preferred Alternative does not generate any queues. With the No-Build Alternative, the High-Level Bridge generates the longest queue of any location and time period in 1990 -- 1.9 miles. Also, northbound in the PM peak hour, a substantial queue of 0.8 miles is generated at the Northern Avenue on-ramp with the No-Build Alternative. These queues are eliminated with the Preferred Alternative. While non-existent with the Preferred Alternative, the No-Build Alternative generates a half mile queue at the Callahan Tunnel off-ramp.

Southbound in the AM peak hour, again no queues will be generated with the Preferred Alternative. The High-Level Bridge (as it does northbound in the PM peak hour) generates a long queue with the No-Build Alternative. This queue is distributed approximately 40 percent to the Mystic-Tobin Bridge (0.6 miles) and 60 percent to Interstate Route 93 southbound (0.8 miles). This bottleneck and its associated queue are eliminated with the Preferred Alternative. The Preferred Alternative eliminates a 0.3 mile queue at the Callahan Tunnel/Haymarket Square off-ramp as well as a 0.6 mile queue expected at the Haymarket Square on-ramp with the No-Build Alternative.

Southbound in the PM peak hour, the primary 1.5 mile queue found at the Massachusetts Turnpike on-ramp with the No-Build Alternative is reduced to 0.2 miles with the Preferred Alternative. The No-Build Alternative and the Preferred Alternative will generate roughly equivalent queues at the Massachusetts Avenue, Albany Street, and Columbia Road on-ramps. Queues of 0.5 mile each produced with the No-Build Alternative at the Haymarket and Purchase Street/Congress Street on-ramp merges are eliminated with the Preferred Alternative. A 0.3 mile queue at the Callahan/Sumner Tunnels and Haymarket off-ramp is also eliminated with the Preferred Alternative.

Year 2010

As noted previously, Table 38 lists the primary individual congestion points and queue lengths for 2010 traffic conditions. With few exceptions, year 2010 traffic conditions will generate queues that are either longer or approximately equivalent to 1990 queues. The discussion below focuses on the most significant changes between the analysis years.

Northbound in the AM peak hour, again, the only queue that will be generated with the Preferred Alternative will occur at the Columbia Road on-ramp; the queues generated at this location with both the Preferred Alternative and the No-Build Alternative are the same length as expected in 1990. Other queues anticipated with the No-Build Alternative either lengthen or remain the same as expected in 1990. A 0.1 mile queue not expected in 1990 will be generated with the No-Build Alternative at the Callahan Tunnel entrance from the Central Artery.

Northbound in the PM peak hour, again, the Preferred Alternative does not generate any queues. However, No-Build Alternative queues from the High-Level Bridge, as well as the Northern Avenue on-ramp, lengthen considerably.

Southbound in the AM peak hour, the High-Level Bridge is again expected to generate a very long queue

ibuted between Interstate Route 3 .9 miles) and the Mystic-Tobin e (1.3 miles) with the No-Build native. This queue is eliminated the Preferred Alternative. er, the Storrow Drive ramps with referred Alternative are expected nerate a 0.7 mile queue, distri- l 60 percent to Interstate Route d 40 percent to the Mystic-Tobin e, not found in 1990.

Southbound in the PM peak hour, own in Table 38, queues are lar to those generated in 1990, slightly longer in some cases for alternatives.

.25 Issues Concerning Traffic Forecasts

This subsection has been uded to clarify the technical sion made during the EIS/EIR ing process to examine all alter- ves in the context of a fixed l of economic activity in the ysis years; this assumption lts in a fixed number of person s for all alternatives.

To generate future traffic mes, the methodology used to cast future traffic assumes the land use or socio-economic erns with the Preferred and uild Alternatives. For the trip ration and trip distribution phase he traffic assignment process, e is a technical consensus that tional information obtained by ng new variables (i.e., differing use and socio-economic variables lternative) into the process is warranted. The actual differences een separately created trip tables relatively minor. An early nical decision was therefore made, confirmed in the EIS/EIR scoping cess, not to try to incorporate the trip tables the effect of erent land use and socio-economic jections that may result from erent highway alternatives.

Traffic assignments were refore based on a fixed land use socio-economic scenario for each analysis year. Results obtained by applying the traffic assignment model in this manner reflect traffic operations under traffic demands which would occur with all other things being equal. This approach maintains a supportable, internally consistent basis for decision making.

It is important to realize that the results of the fixed land use/ socio-economic data traffic assignments have been coordinated closely with -- and have had an effect on -- the land use and socio-economic analyses documented in other subsections of this FEIS/FEIR. The land use/economic activity forecasts implicitly assume that the future transportation system will be able to serve the forecasted land use/economic activities. Such an assumption is consistent with the characteristics of the Preferred Alternative. However, there is a strong possibility that the severe congestion projected with the No-Build Alternative will constrain expected land use changes and economic growth in downtown Boston. Thus, with the No-Build Alternative, the level of trip-making may be constrained by the lack of capacity within the highway network feeding the Boston core area.

Additional Vehicle Trips

The fixed socio-economic conditions assumed for 1990 and 2010 analysis years result in a fixed number of person trips (i.e., a fixed trip table) occurring within the study area for each analysis year. For the Preferred Alternative (and all alternatives which include a new tunnel), this means that a fixed number of additional vehicle trips were assigned to the regional and local highway network, while keeping the number of person trips the same as with the No-Build Alternative.

While the Preferred Alternative increases the number of vehicle trips to and from Logan Airport, the number of trips to and from locations in downtown Boston, East Boston and South Boston are not expected to increase compared to the No-Build Alternative.

Consequently, the reduced cross-harbor congestion resulting from the Preferred Alternative is expected to divert Logan Airport traffic away from higher occupancy vehicles (i.e., from carpools, vanpools, taxis, and limousines) to the private automobile by an estimated 12,800 additional vehicles daily (6,400 vehicles going to the Airport and 6,400 vehicles coming from the Airport). However, preferential treatments for high occupancy vehicles have been incorporated into the design of the Preferred Alternative to minimize diversions from transit and Airport limousines.

Improvements to the regional highway system with the Preferred Alternative actually will reduce the amount of short-cutting which now occurs in East Boston, South Boston, and downtown Boston. Therefore, vehicle trips overall, on the study area <u>local</u> street system with the Preferred Alternative, are expected to be reduced compared to the No-Build Alternative. These vehicle trip reductions are accounted for in vehicle diversions to the regional highway network.

<u>Impact of Diverted Trips</u>

With the Preferred Alternative, of the 534,000 daily vehicle trips assigned to and through downtown Boston, less than one percent would be diversions from transit. However, due to the provision of the new bus lanes to and from the Airport, and to and from South Station, there will be significant opportunity to develop new highway dependent transit services (i.e., bus services) which will partially offset this initial loss. In addition, of the 263,000 daily trips assigned to the Central Artery, less than one percent have been diverted from Route 128 and beyond. Of the additional trips assigned to the Artery, the overwhelming majority will be diverted from local streets and arterials in the immediate study area -- East Boston, South Boston and Downtown Boston.

The traffic diversion component (8,800 vehicles per day) of the cross-harbor traffic increase (22,[illegible] vehicles per day) with the Preferr[illegible] Alternative primarily results from more traffic using the harbor faci[illegible]ties to gain access to the Airport rather than local streets in East Boston or Chelsea because of the increased capacity, and improved traffic service potential (i.e., decreased travel times) on main li[illegible] routes versus local streets.

As outlined in the precedin[illegible] subsections, with the Preferred Alternative, traffic volumes calculated for the year 2010 will [illegible] under somewhat less congested conditions than volumes recorded i[illegible] 1982. The expected level of congestion in the year 2010 with t[illegible] Preferred Alternative is similar t[illegible] what has been experienced over the past two decades -- a period of substantial economic growth in downtown Boston.

4.2.6 <u>Vehicle Miles Travelled, Vehicle Hours of Travel, an[illegible] Person Hours of Travel</u>

Vehicle Miles of Travel (VM[illegible] Vehicle Hours of Travel (VHT) and Person Hours of Travel (PHT) are t[illegible] very important indices with which [illegible] evaluate the effectiveness of alternative transportation improvements. The study area for [illegible] of these three indices includes th[illegible] communities of Boston, Brookline, Cambridge, Chelsea, Everett and Somerville. These are the communi[illegible] most likely to be affected by the proposed changes in the highway network. [In the EIS process, calculations for these three indic[illegible] were also made for a "full region" network, which covers a geographic area generally defined by the Rout[illegible] 128 communities.] All calculation[illegible] are based on the year 2010 "design year".

<u>Vehicle Miles of Travel (VM[illegible]</u> is a measure of the total distance travelled by all vehicles on a stu[illegible] area roadway system. Public polic[illegible]

ɔarticularly since the oil shortages
: the early 1970's] tends to seek to
ıinimize the amount of vehicle miles
:ravelled. However, by virtue of the
mproved characteristics of "supply"
:emming from a major highway
mprovement, increased "demand" for
ravel often results from major
ighway improvements. Changes in VMT
re an index of the increased amount
f vehicular travel expected as the
esult of a major highway improvement.

Vehicle Hours of Travel (VHT)
s a summary of the change (usually
he decrease) in the total hours of
ravel of all the vehicles on a study
rea roadway system. VHT calculations
re utilized in the calculations of
nergy consumption, and can be used in
acro-scale air quality impacts. To
alculate changes in Vehicle Hours of
ravel, the aggregate hours of travel
f all the vehicles on the "build"
etwork [including those vehicles
induced" or added to the network by
irtue of its improved
haracteristics] are compared with the
ggregate hours of the vehicles on the
no-build" network. In the Preferred
lternative, it has been forecast that
here will be 12,800 more vehicle
rips on the "build" network than on
he "no-build" network.

Person Hours of Travel (PHT) is
n index which allows the summary
omparison of the effectiveness of
lternative highway improvements,
xamined in terms of their ability to
arry a common (fixed) number of
rips. While vehicle hours of travel
VHT) calculations summarize the
hange in total hours of vehicle
peration, PHT calculations are
lesigned to reveal the efficiency of a
andidate highway improvement to
ccommodate a given number of person
rips. In the study area, the average
vehicle carries 1.46 persons. PHT
summaries show how well each
alternative performs the task of
arrying a fixed number of trips. For
the purposes of this analysis, the
"build" trip table is used throughout.

The Preferred Alternative is compared with the Base Case for each of the three indices, below:

Base Case

Annual VMT = 3,302.9 million miles
Annual VHT = 150.1 million hours
Annual PHT = 223.4 million hours

Preferred Alternative

Annual VMT = 3,320.6 million miles
Annual VHT = 140.9 million hours
Annual PHT = 205.8 million hours

Differences - Preferred
Alternative vs. the Base Case

Annual VMT = +17.7 million miles
Annual VHT = -9.2 million hours
Annual PHT = -17.6 million hours

The Results. Consistent with most highway improvements, implementation of the Preferred Alternative will increase total VMT in the study area by about 17.7 million miles per year. This increase represents about 1-1/2 percent of the study area VMT, and about 1/2 of 1 percent of the full (128 region) network. In terms of VHT, it is forecast that, even with the addition of 12,800 new trips daily to the highway network, total number of hours of vehicle operation will decrease by 9.2 million in the study area. These two findings (VMT increases, while VHT decreases) are not inconsistent. The data shows that some individual motorists will change their routes in order to minimize travel time, using the new highway segments. In some cases, these new routes will be longer in terms of distance than the previous routes taken. In addition, some 12,800 new vehicle trips are added to the system, further contributing to the increase in VMT.

The VHT statistics show that the total number of vehicle hours of operation will decrease by 9.2 million per year, in spite of the fact that there are 12,800 new trips being taken in the Preferred Alternative. This implies that the reduction in travel

time for the original vehicles (i.e., those in the base case) is 9.2 million hours greater than the additional hours of operation of the new vehicles to the system.

The PHT statistics show that the Preferred Alternative carries its projected volume of vehicles with 17.6 million fewer person hours of travel than the Base Case highway network would carry that same number of vehicles, as shown previously in Table 28. The PHT statistics are used in calculating the level of travel time savings, or "user benefit", for each of the alternative highway improvements tested.

The Preferred Alternative also shows a decrease of approximately 6.1 percent in total vehicle hours of travel and a 7.9 percent decrease in person hours travelled when compared to the No-Build Alternative. This reduction results from increased travel speeds made possible because of increased capacity (and resulting improved levels of service). In addition, the increased capacity and improved service of a depressed Central Artery also encourages "through" motorists to stay on the Central Artery, rather than divert to parallel local streets.

4.2.7 Safety

Accident Potential

Highway System

Table 39 summarizes predicted yearly accidents along the Central Artery/Southeast Expressway, including approaches to the existing and Third Harbor Tunnels, and to the existing and proposed tunnel approaches in East Boston for the No-Build and Preferred Alternatives. For comparison purposes, the average annual number of accidents occurring at these locations between 1978 and 1980 is also contained in Table 39.

Discussions of existing accident history on these major highway sections, as well as predicted 1990 and 2010 accident potential withou the project (No-Build Alternative) are contained in Section 3.1.3 SAFETY. In summary, total acciden on the major highway sections are estimated to increase over existin levels by 9 percent in 1990 and 21 percent in 2010. The increases re from increased traffic on the road network.

The Preferred Alternative reduces accident potential on the regional highway system in 1990 by 9 percent, and in 2010 by 27 percent compared to the No-Build Alternati

Local Roadway System

Projections of future accid potential at local intersections i South Boston, East Boston, and dow town Boston are summarized in Tabl 40. Existing accidents (1978-1980 average) are also included in Tabl for comparison purposes.

Discussions of existing acc dent history and predicted acciden potential for 1990 and 2010 withou the project (No-Build Alternative) were also contained in Section 3.1. In summary, total annual accidents the selected intersections in Sout Boston will increase by 17 percent 1990 and 24 percent 2010 with the No-Build Alternative. Increases a due to predicted regional traffic growth and new traffic generated b proposed developments in South Boston. In East Boston, the growth i total number of accidents at the selected intersections will be mor modest, with values of 5 percent f 1990 and 12 percent in 2010. The highest percentage growth in the t number of accidents expected to oc will be for the selected intersect in downtown Boston, reflecting the major increases in traffic predict for local streets in that area. T percentage growth in accidents predicted in downtown Boston is 24 percent by 1990 and 32 percent by 2010. For the selected intersecti in South Boston, East Boston, and Downtown Boston combined, accident potential with the No-Build Altern

Table 39

FUTURE REGIONAL HIGHWAY SYSTEM ACCIDENT SUMMARY

	Average Existing	No-Build Alternative		Preferred Alternative	
	1978-1980	1990	2010	1990	2010
ntral Artery					
Section 1*	381	454	470	337	360
Section 2*	235	260	284	165	186
Section 3*	197	201	232	134	151
Section 4*	200	203	206	181	199
SUBTOTAL	1013	1118	1192	817	896
st Boston nnel Approaches	159	164	226	91**	141**
TOTAL	1172	1282	1418	908	1037

Section 1: Rte I-93/Rte 1 to Causeway Street
Section 2: South of Causeway Street to Callahan/Sumner Tunnels
Section 3: South of Tunnels to Beach Street
Section 4: Kneeland Street to Southampton Street

Includes estimated future accidents on Third Harbor Tunnel and its approaches.

Table 40

FUTURE LOCAL ROADWAY SYSTEM ACCIDENT SUMMARY

	Average Existing 1978-1980	No-Build Alternative 1990	No-Build Alternative 2010	Preferred Alternative 1990	Preferred Alternative 2010
South Boston					
Columbia Road/Old Colony Ave./ Day Blvd.	11	14	15	9	9
Andrew Square	8	11	12	8	9
Columbia Road/Day Blvd./L St.	5	5	5	4	4
L St./Summer St./E. First St.	7	9	9	9	9
Dorchester Ave./W. Broadway	9	9	10	14	15
Summer St./D St.	10	10	10	11	12
Dorchester Ave./W. Fifth St./A St.	10	9	10	11	14
Dorchester Ave./W. Fourth St.	10	10	10	14	15
Congress St./A St.	4	6	7	9	9
Northern Ave./Sleeper St.	8	13	14	8	9
SUBTOTAL	82	96	102	95	105
East Boston					
Condor St./Meridian St.	13	13	14	16	16
Bennington St./Bremen St.	7	7	8	7	8
Bennington St./Chelsea St.	23	24	25	24	25
Meridian St./Bennington St.	13	14	15	14	14
Porter St./Cottage St.	2	3	3	2	2
SUBTOTAL	58	61	65	63	65
Downtown Boston					
Causeway St./No. Washington St.	26	31	34	18	21
Congress St./North St.	11	14	15	10	11
New Chardon St./Merrimac St.	10	10	10	9	10
New Chardon St./No. Washington St.	5	6	6	7	7
Sudbury St./Congress St.	22	31	33	35	38
SUBTOTAL	74	92	98	78	86
TOTAL	214	249	265	237	257

ive will increase by 16 percent by 990 and 24 percent by 2010 over xisting conditions.

In general, for South Boston, he Preferred Alternative will slighty increase the total number of ccidents in 2010 for the analyzed ntersections by 3 percent when ompared to the No-Build Alternative.

Within East Boston, the total umber of accidents for intersections nalyzed for the year 2010 will be the ame for both the No-Build Alternative nd the Preferred Alternative.

The total number of accidents or the year 2010 in downtown Boston or the selected intersections studied vill decrease by 11 percent compared o the No-Build Alternative.

Overall, for the local street etwork analyzed in South Boston, East Boston, and Downtown Boston, the total umber of annual accidents for the Preferred Alternative in 2010 is estimated at 257 as shown in Table 40. The total for the No-Build Alternative is estimated at 265. This represents a 3 percent improvement in safety at local intersections within the study area.

Regional Highways and Local Roadways Combined

Combining the accident potential estimates for selected regional highway and local roadway sections contained in Tables 39 and 40, accident potential will be reduced by 25 percent in 1990 and 23 percent in 2010 for the Preferred Alternative compared to the No-Build Alternative.

Hazardous Cargoes

The Preferred Alternative will affect both the routing and safety of hazardous cargo vehicle movements through downtown Boston. Routing changes mainly result from the depression of the Central Artery into a tunnel through which passage of such vehicles will be prohibited.

The Code of Federal Regulations (Part 397) states that "...unless there is no practicable alternative, a motor vehicle which contains hazardous materials must be operated over routes which do not go through or near heavily populated areas; places where crowds are assembled, tunnels, narrow streets, or alleys". Adhering to this code in heavily congested areas, such as downtown Boston, often involves making trade-offs. With both the Preferred and No-Build Alternatives, hazardous cargo vehicles must use existing surface streets through heavily populated areas in downtown Boston to avoid the Dewey Square Tunnel. In addition, with the Preferred Alternative, hazardous cargo vehicles must also use the new Surface Artery north of the Dewey Square Tunnel to avoid the depressed Central Artery in downtown Boston.

Southbound hazardous cargoes will exit the Central Artery using the Causeway Street off-ramp, and join the southbound Surface Artery traffic at Haymarket Square. Between Dewey Square and Kneeland Street, southbound hazardous cargoes will use the new Surface Artery. Northbound hazardous cargoes will also use the new Surface Artery between Kneeland Street and the Causeway Street northbound Central Artery on-ramp.

The improved design features of the Preferred Alternative's new Surface Artery generally will have a beneficial impact on safety. Even though (with the Preferred Alternative) hazardous cargo vehicles will encounter large numbers of pedestrians and more vehicle conflicts than on the elevated Central Artery (due to intersections and off-street access) with the No-Build Alternative, there is a higher potential for more severe accidents involving hazardous cargoes on the elevated Central Artery, particularly during the off-peak hours when speeds will be higher on the Central Artery than on the Surface Artery.

Unlike downtown Boston, there

is no practicable, well-designed surface street routing that can be used to avoid heavily populated areas in South Boston. Rather than using local streets in South Boston, hazardous cargo vehicles (with the Preferred Alternative) will be using the new Seaport Access Tunnel through South Boston. The design of the new Seaport Access Tunnel incorporates various safety features which will mitigate potential problems involving hazardous cargoes (e.g., deluge pumps, automatic foamite dispenser system). These features are described in Section 2.5.2 OTHER DESIGN CONSIDERATIONS. The use of this tunnel will, overall, reduce the potential for hazardous cargo vehicle accidents on local South Boston streets compared to the No-Build Alternative. Compared to a Seaport Connector, which is assumed to be constructed as a separate project with the No-Build Alternative, the Preferred Alternative diverts some 13,600 additional vehicles per day from the local streets, including some 3,000 trucks, many of which will carry hazardous cargoes.

Emergency Vehicle Access

The Preferred Alternative will improve access across Boston Harbor for fire, police, ambulance, and other emergency vehicles. Emergency vehicles, with the Preferred Alternative, will be able to respond to calls faster due to reductions in travel times on major highways, as mentioned previously. A Third Harbor Tunnel will provide an alternative travel route for emergency vehicles in the event that one or both of the existing tunnels become blocked temporarily due to an accident or other reasons.

The Preferred Alternative will add one travel lane in each direction along the Central Artery. This additional capacity will serve to decrease congestion and increase travel speeds for emergency vehicles needing to use this facility. Additionally, the new South Bay interchange connections between the Central Artery/Third Harbor Tunnel/Southeast Expressway/Herald Street Extension, as well as improved connections betwe the Callahan/Sumner Tunnels, the Central Artery, and the surface stı system with the Preferred Alternati will, in general, offer improved travel times for emergency vehicles which will also be allowed to use these ramps.

The No-Build Alternative do not offer these improved connectio and resulting travel time improvements, since the redecking of the existing Central Artery will not increase capacity in the project a

4.2.8 Other Transportation Facili

Ferry Services

In the long term, the No-Bu Alternative will most likely incre patronage on harbor ferry services used for commuter purposes. That as congestion and delays on the Central Artery and Southeast Expres way become more severe with the No-Build Alternative, additional motorists can be expected to chang modes from the private automobile t commuter ferry. Since the Southeas Expressway will continue to be congested with the Preferred Alternat commuter ferry patronage should increase in a similar fashion.

Logan Airport

As detailed in Section 3.1 TRANSPORTATION FACILITIES, roadway connections between Boston and the airport will become more congested through 2010 with the No-Build Alternative. This situation will occur traffic volumes equal or exceed capacity on Central Artery approach to the existing tunnels, the tunne themselves, the Route 1A ramps connecting the tunnels with the Airpo access/egress roads, and the Airpo roadway system, itself.

In addition, with the No-Bui Alternative, average vehicle occupancies (i.e., the number of perso per vehicle) in the tunnels bound t Logan Airport will increase as more persons divert to alternative trave

odes (e.g., the Blue Line rapid transit system, bus services, taxis, and airport limousines), rather than contend with the intensifying congestion in one or two occupant vehicles.

The traffic forecasting procedure for this EIS/EIR assumed that the Preferred Alternative (as was assumed for all build alternatives including a Third Harbor Tunnel) will generate some 12,800 more vehicle trips (6,400 to and 6,400 from Logan Airport) per day than the No-Build Alternative in the year 2010; some 600 of these trips (300 each way) were assumed to be diversions from public transportation, while the rest were diverted from other rubber-tired vehicles. In order to deal with this forecasted impact, the project was redesigned to include several features to promote and encourage the use of public transportation to Logan Airport. Travel forecasts show that the use of the direct ramp connections from Logan to South Station will result in a net increase in public transportation ridership to Logan over the No-Build Alternative. This service, combined with an increase in bus/limousine service using the Preferred Alternative's facilities, would increase total public transportation ridership to the Airport by 20 percent on an average day.

The Preferred Alternative will have a major positive impact on traffic circulation and access to Logan Airport because it provides:

o A more direct connection into the passenger terminal area of the Airport than does the No-Build Alternative, and eliminates the necessity of all traffic bound to and from the terminal area to pass through the signalized intersections at the existing north-south Cross Road (the No-Build Alternative defined for this EIS/EIR assumed the existence of the Cross Road intersections; Massport is currently operating an experiment to redirect traffic and eliminate the need for these two signals), and;

o A new South Bay interchange, featuring an exclusive bus lane to and from the Third Harbor Tunnel, which will allow direct public transportation connections to Logan Airport. These connections will allow Airport passengers to use ground transportation services which would terminate at or originate from the South Station Transportation Center (SSTC). The SSTC could, therefore, be developed by the Commonwealth as a separate project to serve as a remote transfer terminal to the Airport. Given that buses and Airport limousines will be given preferential treatment on ramps connecting the tunnel with South Station, the airlines could conceivably operate baggage checking operations out of the SSTC.

With the Preferred Alternative, a grade separation will be provided between the future Airport Cross Road and the Airport access/egress roads. Motorists entering or leaving the Airport via Route 1A will experience reduced travel times and less congestion due to improved traffic flow on the main Airport roadway as well as Third Harbor Tunnel roadways to the west of the terminal area. One disadvantage of the Preferred Alternative is the longer access route from the Callahan Tunnel to Bird Island Flats. While access from the Callahan Tunnel to Bird Island Flats will be more circuitous than with the No-Build Alternative, reduced congestion on the Airport access/egress roads will result in acceptable traffic operating conditions for the longer trip. Continued study of design refinements indicates that it may be possible to retain this direct right turn to Bird Island Flats.

The Massport master plan for Logan Airport calls for double-decking the access to the Airport terminals to separate arrivals and departures. The Preferred Alternative design features at Logan Airport can be incorporated into future Massport double-decking roadway circulation improvements

through the use of "switch back" ramps or other down-ramping schemes to gain access to lower-level Airport services (e.g., arrivals), the Third Harbor Tunnel, or Route 1A ramps. The development of the Preferred Alternative has been coordinated with Massport throughout this EIS/EIR process to provide consistency, to the extent possible, with future Airport development plans.

Public Transportation

As indicated in Section 3.1 TRANSPORTATION FACILITIES, the No-Build Alternative will increase long-term demands for cross-harbor public transportation as a result of increased congestion on the highway network.

A manual sensitivity analysis (excluding Airport trips) incorporating such factors as parking availability, the quality of services offered by competing transportation modes, congestion, out-of-pocket costs, and travel times was undertaken by the Central Transportation Planning Staff (CTPS). This analysis concluded that if, as expected, CBD parking is less available in the design year than it is today, the Preferred Alternative would result in a drop of public transit usage of less than one percent. Alternatively, if parking is not more constrained than at present by the design year, the analysis indicates that the Preferred Alternative will decrease public transportation trips in the region by about 1.4 percent as compared to the No-Build Alternative. This reduction in regional transit trips will be partially offset by improvements in airport-related public transportation allowed by the Preferred Alternative. The key findings of the analysis, as they pertain to the Preferred Alternative, are summarized below:

- To and from areas to the north and northeast of downtown Boston, a slight decline in rail public transportation ridership will occur while bus service will improve;

- To and from areas to the wes and southwest of downtown Boston, ridership on express bus services is expected to increase, and;

- To and from areas south and southeast of downtown Boston rail public transportation ridership is expected to decline. This will be offse somewhat, by a slight increa in express bus ridership attributable to the busway improvements in the South Ba area. Bus ridership would further increase with the implementation of a separate project that would include a planned bus lane along the Southeast Expressway.

The long-term impacts of the Preferred Alternative on the many M bus routes within the study area wi be minor in terms of required routi changes resulting from changes in t roadway network configuration. Mos of these changes will affect bus routes serving Broadway and Haymark Stations as well as the South Stati Transportation Center.

At the Broadway Station in South Boston, with the Preferred Alternative, the Broadway Bridge wi be replaced by a new Herald Street Extension that will intersect Dorch ter Avenue north of the existing Broadway alignment. The Herald Str Extension design has been coordinat with an on-going MBTA Broadway Stat Modernization project. In addition the proposed new South Bay intercha between the Massachusetts Turnpike/ Third Harbor Tunnel/Southeast Expre way/Central Artery/Herald Street Extension will provide new options improving South Boston bus services It is expected that future bus conn tions to the MBTA Red Line Broadway Station will improve with the Preferred Alternative.

All bus routes to be consolidated at the South Station Transpor tion Center will benefit with the Preferred Alternative. Exclusive b

ınes incorporated into the proposed ›uth Bay interchange discussed above ill result in savings for regional 3TA and private carrier bus services erving Northern New England. These ıs lanes will provide direct connecions between the South Station ransportation Center and the Central rtery, the Southeast Expressway, the assachusetts Turnpike, and the Third arbor Tunnel. In addition, buses enefit from reduced congestion on ummer Street and in the Dewey Square rea. The Third Harbor Tunnel, as ell as the depressed and widened entral Artery provided with the referred Alternative, will reduce ravel times for all bus connections o and from the north for private perators such as Greyhound, railways, and Vermont Transit.

Buses entering Boston via nterstate Route 93 to Haymarket tation will be required to use the ew Causeway Street off-ramp rather han the previously-used Haymarket quare off-ramp. While some delays ıay be experienced by buses using this amp at the Causeway Street intersecion, buses entering Haymarket Station ›reviously were delayed on the Central ırtery and on the Haymarket exit ramp ›ecause of heavy traffic volumes on :he highway and on the local roads. [n addition, the construction of a :eplacement parking garage by the ıBTA, possibly at Canal Street/Haverıill Street (see Section 4.2.10 ?ARKING IMPACTS), may offer a significant opportunity to create a ıew, enclosed bus-to-transit intermodal transportation center at Haymarket Square. MBTA buses will generally benefit from improved downtown Boston traffic circulation.

Certain bus services to and from the MBTA Haymarket Station in downtown Boston will also benefit with the Preferred Alternative. Specifically, a new on-ramp to the Central Artery northbound will be provided from Causeway Street. Combined with Surface Artery improvements, this new ramp will make bus travel between Haymarket Station and the northbound Central Artery much easier. Bus routes to the north will also be able to avoid City Square in Charlestown by using this new on-ramp. Express bus services to other North Shore communities will also benefit from proposed roadway configuration changes. These bus routes will be able to use a new on-ramp from Haymarket Square directly into the Callahan Tunnel, thus bypassing the existing heavily congested intersection of Blackstone Street/ North Street/Central Artery off-ramp.

Other than those routes that terminate at South Station Transportation Center and at Broadway Station in South Boston, as mentioned above, MBTA bus routes in South Boston will not be directly affected by the tunnel construction through South Boston. Buses will be able to use the same streets as they do today. However, the Third Harbor Tunnel's proposed interchanges in South Boston will provide the MBTA with new routing options which may improve its South Boston bus services.

Overall, particularly due to the direct ramp connections provided at the South Bay interchange, highway-dependent public transportation services in the study area will improve over the No-Build Alternative with the Preferred Alternative.

Commuter rail services to and from Boston's North and South Stations will not be directly affected in the long term by the Preferred Alternative because of provisions to relocate tracks and maintain services. Amtrak and MBTA services to South Station, and MBTA service to North Station, will be affected during construction. Temporary track will be provided to maintain service. There will be close coordination with Amtrak, the Federal Railway Administration (FRA), and the MBTA during the construction stage. In the long term, Amtrak and MBTA services will not be adversely affected, although occasional releveling of the track beds in the South Bay area may be necessary to correct long term settlement in this area.

4.2.9 Construction Impacts

No-Build Alternative

The No-Build Alternative, with redecking, will require a construction period of about three years. The No-Build Alternative, like the Preferred Alternative, will have several construction impacts.

The redecking construction staging procedure for the No-Build Alternative in the High-Level Bridge area calls for travel lanes on the Central Artery to be reduced from 6 to 4 (see Section 4.1 DESCRIPTION OF CONSTRUCTION). This reduction in lane capacity will degrade traffic levels of service, on occasion extending congested peak operating conditions into what are normally off-peak hours.

On the Central Artery south of Causeway Street, one lane at a time will be out of service, with temporary by-pass lanes used to maintain six through lanes. The Central Artery currently operates above its theoretical capacity -- i.e., at peak conditions -- for 4 to 8 hours of the day. Traffic flow is subject to break down from relatively minor disruptions during these hours. During the redecking, along with the slowing of traffic resulting from the normal curiosity factor (i.e., "rubbernecking") associated with any roadside disturbance, the capacity of the Artery will be reduced at construction zone bypasses as 12-foot lanes are channelized into narrower 11-foot lanes. Vehicle operating speeds will decrease sharply in these areas. The resulting 10 percent reduction in capacity will cause additional bottlenecks with lengthier queues. The impact of the increased traffic on the Central Artery will be realized on its connecting expressways (particularly Interstate Route 93 to the north and the Southeast Expressway to the south).

With respect to regional traffic flow, redecking the High-Level Bridge area is of greater concern. Due to the bottleneck at this location and doubledecking of the northbound and southbound directions of the Central Artery on the bridge, it will be impossible to maintain three lanes in each direction during peak hours. Increased congestion and queuing will occur for at least an eighteen-month period while the bridge and Leverett Circle connections are being redecked; detour routes would be developed to reduce this congestion.

Also during the redecking construction period, traffic diversions from the Southeast Expressway/Central Artery to parallel local roadways will occur during the peak and off-peak hours, adding to congestion on adjacent surface streets in South Boston, downtown Boston, and East Boston.

Traffic flow on all Central Artery ramps will be maintained at all times during redecking. At least half the width of each ramp (11 feet) will be available for use at all times while the remaining half is being reconstructed. Also, one or two lanes of the Surface Artery, depending upon location of the redecking operation, will be closed in the immediate area(s) under the construction zone. These closures will result in some additional congestion on the Surface Artery as traffic attempts to move through the construction area. Once traffic has bypassed the construction area, normal capacity (i.e, number of lanes) on the Surface Artery will be available for traffic movements. These impacts will be most notable during the peak periods, but will also cause motorists inconvenience during the off-peak hours of the day.

Overall, the Preferred Alternative will have more significant local street network traffic impacts during construction than the No-Build Alternative. The redecking, however, requires construction activity throughout the full length of the Central Artery through downtown Boston. Therefore, when examining the construction period impacts on regional expressway traffic, the Preferred Alternative has the benefit of leaving the existing Central Artery

ervice throughout the construction eriod (including a phase, starting in he eighth year of construction, in hich the viaduct is in use in addi-ion to portions of new underground oadway). At the end of the Preferred lternative construction period, all raffic will be transferred to the new epressed Central Artery, allowing the emolition of the existing viaduct.

In short, while the construc-ion time period is longer for the referred Alternative and the disrup-ion to traffic using the local street etwork is more severe, the provision f continuous through service for the eavy component (60-65 percent) of egional traffic on the Central Artery s better handled by the Preferred lternative than by redecking with the o-Build Alternative.

referred Alternative

The Preferred Alternative equires a construction period of bout 12 years. The analysis of onstruction traffic impacts over the 2-year construction period for the referred Alternative covers five orridors:

o South Boston;

o South Bay/Fort Point Channel corridor;

o Central Artery/Surface Artery corridor from Dewey Square north to Causeway Street;

o The Storrow Drive/Leverett Circle connector ramps from Causeway Street to the Central Artery North Area Project; and

o Logan Airport (East Boston).

Proposed phasing for the Preferred Alternative calls for the depression of the Central Artery to be initiated simultaneously with the construction of the South Boston and South Bay/Fort Point Channel sections.

Table 41 lists the existing Central Artery ramps that will be closed for a period longer than a month during construction of the Preferred Alternative. Also provided in Table 41 are the 1982 traffic volumes on each of the facilities and possible alternative routes for traffic during the periods the ramps will be closed.

Each of the five construction corridors has construction sequences described in Section 4.1.2 CONSTRUCTION SEQUENCING and in the Supportive Engineering Report. Construction staging sequences have been organized to maximize maintenance of major traffic flows throughout construction. This section focuses on the critical traffic implications of those construction periods.

Construction of the South Boston, South Bay/Fort Point Channel, and Central Artery corridors is assumed to begin in January 1987. Construction of the Third Harbor Tunnel is expected to be completed by January 1991. This date also marks the expected start of construction of the Storrow Drive/Leverett Circle ramp connections to the Central Artery; within the overall 12 year construction framework, this construction schedule may be revised to accommodate land development considerations.

Construction period impacts are summarized below by corridor. The discussion of each corridor includes, where appropriate, a description of the traffic implications of construction activities in other adjacent corridors that interact with activities in the corridor being discussed.

There are a number of measures which will be taken to reduce disruption during construction of the proposed improvements. Specific details will be developed during the design phase, based on input received from all affected groups, including residents, commuters, and merchants. The MDPW is committed to providing measures to mitigate construction impacts and disruption, to the extent possible.

Table 41

EXISTING RAMPS CLOSED FOR A PERIOD LONGER THAN ONE MONTH DURING CONSTRUCTION OF PREFERRED ALTERNATIVE

	Ramp	1982 AWDT	Alternative Route
1.	Route I-93 SB Off-Ramp to Storrow Drive	22,200	I-93 SB to Ramp CS-W to Causeway St Sullivan Square, Rutherford Avenue, and Gilmore Bridge and through Leverett Circle
2.	Route I-93 NB On-Ramp from Storrow Drive	23,600	Leverett Circle to old Charles Rive Dam to Gilmore Bridge and Rutherfor Avenue
3.	Central Artery SB On-Ramp from High Street/Purchase Street	11,600	Purchase Street to Congress Street On-Ramp
4.	Central Artery NB Off-Ramp to Causeway Street	10,350	Leverett Circle to Lomasney Way Causeway Street

Some of these measures in-
.ude: extensive use of the media ınouncing traffic or access changes ıd displays describing the ›nstruction activities, etc. Use of :her transportation modes to commute › the City could also be promoted. ηplementing these measures, however, ill require extensive coordination ıd cooperation from various public City of Boston, MBTA, etc.) and rivate (local newspapers, radio tations, etc.) concerns, since many ossible measures are beyond the urisdiction of the Massachusetts epartment of Public Works and the ederal Highway Administration. These nd other impact mitigating measures re discussed, as appropriate, in the ollowing sections.

South Boston

The Preferred Alternative irectly affects the interior of South oston to the east of the Fort Point hannel. The construction of the eaport Alignment Tunnel will require se of temporary detour roads at everal locations. Of particular mportance is the need to replace the ummer Street bridge over the railroad racks. (It is important to note, owever, that the Summer Street bridge s currently posted for weight re-trictions and will need to be re-laced with or without the project.) he existing bridge will first be eplaced by an adjacent temporary our-lane bridge for approximately one ear. Adverse traffic impacts during his period should be minimal, as ither the existing or the temporary ridge will be in service at all imes. However, for two months prior o the use of this temporary struc-ure, repairs to the retaining walls f the existing bridge, required as art of Summer Street bridge replace-ment, will reduce the capacity of the ridge by 50 percent. This can be xpected to cause some delays to Summer Street traffic, especially luring peak hours. When the new ridge is completed, Summer Street raffic will be switched from the emporary bridge to the new structure, with no interruptions in traffic service.

A short segment of A Street will be replaced for five months by a temporary two-lane bypass while construction of the tunnel proceeds beneath it. Later in the construction process, traffic on the easternmost segment of Northern Avenue and the private EDIC access road (also re-ferred to as "A" Street, though not the same "A" Street as mentioned above) to the east of Commonwealth Pier will operate over a short four-lane temporary bypass during Third Harbor Tunnel construction for a four-month period. Travel delays on both detours will be minimal.

Viaduct-Ramp Street will be closed to traffic for an estimated two-year period. An elaborate detour will be required. B Street, in the vicinity of its intersection with Congress Street, will remain open, serving as part of the detour to maintain access to the Commonwealth Pier area via local streets from the south. While motorists who formerly used Viaduct-Ramp Street in this area will find the detour circuitous, the discouragement of north-south local traffic movements is consistent with local South Boston traffic planning objectives.

Only Congress Street between B Street and the new on- and off-ramps to the Third Harbor Tunnel will be closed permanently as a result of the construction of the Preferred Alterna-tive. This portion of Congress Streetis upaved and privately-owned. While this closure will inconvenience motorists presently using Congress Street (the 1982 AWDT volume in this unpaved section of roadway is 3500 vpd), they will be able to divert to Northern Avenue, which has the capa-city to accommodate the additional traffic at an acceptable level of service.

During construction of the Preferred Alternative, it is antici-pated that the following roadways will

be ready for use about 3 to 4 years into construction:

- o The new project service road between Congress Street and Northern Avenue;
- o The new easterly on- and off-ramp system connecting the Seaport Access Alignment Tunnel and Third Harbor Tunnel with Summer Street and Northern Avenue, and;
- o The Seaport Access Alignment Tunnel between the Third Harbor Tunnel and the Southeast Expressway/Massachusetts Turnpike and these interchanges.

The availability of these roadways and interchanges as well as a relocated Dorchester Avenue will improve access from the south and southwest to the northern sections of South Boston (and downtown Boston) while work on the Central Artery depression proceeds. Simultaneously, they will remove truck and automobile traffic from various South Boston local streets and connecting roadways during and after the construction period.

South Bay/Fort Point Channel Crossings

Construction of the Preferred Alternative will proceed with the objective of placing northbound traffic in the new Fort Point Channel tunnel section and on the relocated Dorchester Avenue as soon as possible. Traffic now using the Broadway Bridge will be able to cross the railroad tracks throughout the construction period. The Broadway Bridge will not be closed permanently until the Herald Street Extension has been completed. The West Fourth Street Bridge, currently closed, is assumed to be reconstructed prior to the initiation of this project. It will, therefore, be available to traffic throughout the South Bay/Fort Point Channel construction period. Further north in the Fort Point Channel, the Summer Street, Congress Street, and Northern Avenue bridges will also remain open to traffic throughout construction. By using constructin techniques outlined previously, th tunnel for the relocated Dorcheste Avenue will be constructed beneath these bridges without interrupting traffic. Several temporary bypass detours with capacities similar to those of the replaced roads will b constructed to maintain the flow of traffic on the interchange of the Massachusetts Turnpike with the Southeast Expressway.

These required roadway changes will redistribute traffic from bridges and ramps closed or reduced in capa-city to those which remain open. Some resulting increases in traffic on local streets in South Boston near the Central Artery can be expected. Additional congestion will occur at the intersections of bridges which remain open and roadways parallel to the Southeast Expressway/Central Artery.

Because several constructi contracts will be necessary with the Preferred Alternative, constructi of the complicated South Bay interchange will be closely coordinated with the Central Artery construction so th continuous flow between the Massachu-setts Turnpike and the Central Artery will be maintained at all times.

Central Artery/Surface Artery Corridor

At all times, six or more travel lanes will be available fo Central Artery traffic with the Preferred Alternative.

The construction period fo depression of the Central Artery will generate from 500 to 1,000 truck trips per day during excavation. During the excavation phase of construction, temporary haul road will be provided along the Central Artery work area to minimize the impact these trucks will have on local streets in downtown Boston. Otherwise, project-related trucks will generally have an adverse impact on local and regional traffic flow. Most of these trucks (as

truckers are inclined to do in congested areas) will be using the street system in off-peak hours to avoid peak period congestion.

Construction of the Central Artery depression will proceed in five areas at once as shown in the Supportive Engineering Report. The first 15 months of construction (September 1986 to January 1988), primarily utilities relocation, will result in traffic disruptions on streets crossing the Central Artery corridor. In all cases, at least two traffic lanes will be maintained on each cross street through temporary crossings, allowing traffic to flow across the Surface Artery. If possible, only one street crossing will be affected at any given time. Primary adverse traffic impacts will occur on cross streets in the peak hours. Detours will result in bottlenecks at the Surface Artery and Atlantic Avenue, and occasionally cause back-ups on intersecting streets.

The most serious impacts on local downtown Boston traffic during the Central Artery depression will begin to occur during the second year of construction, and will last until the middle of the fifth year of construction (January 1988 to July 1992). Construction of the slurry walls paralleling the Artery will require the closure of certain lanes on the existing Surface Artery/Atlantic Avenue corridor. A study of traffic operations along the Surface Artery/Atlantic Avenue corridor was made to address traffic impacts during the slurry wall construction phase. The study (see Appendix 3) indicated that even though travel lane capacity along the corridor will be reduced by a maximum of two lanes in each direction, through the removal of on-street parking (replaced by off-street parking), the key constricting intersections will handle peak period traffic volumes at levels of service comparable to what will occur with the No-Build Alternative in 1990. During this period, six lanes of through traffic will be maintained on the existing Central Artery. Summer Street, Pearl Street, Congress Streets, High Street, Franklin Street, Federal Street, and Milk Street will carry heavier volumes than usual. Transit ridership is expected to increase.

Access to properties adjacent to Atlantic Avenue will be maintained.

Also during this time period, the Atlantic Avenue on-ramp will be closed and replaced with a temporary on-ramp at State Street. At six-month intervals over a two-year period, these ramps will alternately be closed and opened to maintain northbound access to the Central Artery.

At the end of the slurry wall and utilities relocation construction sequences, with the Preferred Alternative, both Atlantic Avenue and the Surface Artery will again be open to traffic. Excavation and construction of the depressed Central Artery will proceed. The elevated Central Artery, underpinned during the previous construction sequence, will remain in operation until the depressed Artery and its connections are completed.

The next period of significant traffic disruption with the Preferred Alternative lasts for approximately two years. It requires the alternate closing of one traffic lane at a time in both the Callahan and Sumner Tunnels.

Callahan Tunnel (Outbound) Lane Closure

The Third Harbor Tunnel will be opened at this time. At the outset of this construction sequence, the short section of Cross Street between Fulton Street and the Callahan Tunnel will be removed. For one year (i.e., six months for each of the lanes), only one lane of the approach to the Callahan Tunnel will be open to traffic from local streets. The tunnel itself will retain two lanes.

Effectively, three outbound and four inbound tunnel lanes will be available for cross-harbor traffic, as compared to the four existing cross-

harbor tunnel lanes.

During this period, some cross-harbor traffic coming from downtown Boston on the Central Artery that would otherwise have been using the Callahan Tunnel, will probably divert to the new tunnel via Northern Avenue or Congress Street.

Sumner Tunnel (Inbound) Lane Closure

During the succeeding period of construction, one lane of the exit from the Sumner Tunnel will be closed for a period of approximately one year (again, six months for each of the two lanes). While two lanes could be maintained inside the Sumner Tunnel, in this case, traffic will be merged into one lane at the entrance of the tunnel (the other lane being used as an emergency or breakdown lane). This will eliminate the need for a congestion producing and hazardous merge at the exit.

As mentioned above, the Third Harbor Tunnel will be available to accommodate cross-harbor traffic. Traffic from East Boston and the North Shore area using the Central Artery both north and south of the existing tunnels will be able to use the Third Harbor Tunnel. Motorists who use the Third Harbor Tunnel to go to the downtown Boston Financial District during this period will be able to exit in South Boston at the Congress Street/Northern Avenue ramps. The increase in traffic at these ramps will probably result in peak period congestion on the ramps and increased traffic volumes on Summer Street, Congress Street, and Northern Avenue.

Central Artery Ramp Impacts

Throughout construction of the Preferred Alternative, access to the Central Artery will be maintained either through existing ramps or replacement ramps. Replacement ramps will be necessary at three locations: Atlantic Avenue/State Street on-ramp; New Chardon Street off-ramp; and North Street off-ramp. Access to these ramps will be alternated over about a six month period.

During the final stages of construction, major traffic routing changes are required to complete the Storrow Drive/Leverett Circle connections to the new depressed Central Artery. The construction activities in the two areas will be coordinated to minimize adverse impacts associate with ramp closures in the two areas.

Storrow Drive/Leverett Circle Connecting Ramps from Causeway Street to the MDPW's Northern Project Limits

Construction of the Storrow Drive/Leverett Circle connecting ramps is assumed to begin in the fifth year of construction. With the exception of a three month period while Leverett Circle construction takes place, traffic impacts during the first three years of construction should be minimal. Construction trucks are the primary source of traffic impacts during this period.

Construction of proposed improvements at Leverett Circle will reduce capacity of the Circle by about one-third for about three months, as the new off-ramp from the Central Artery to Storrow Drive westbound is completed. Completion of this connection is necessary before the depressed Central Artery can be opened to traffic. During these periods, traffic congestion at Leverett Circle will increase in duration, perhaps extending another hour during both the morning and evening peak periods.

Once the depressed Central Artery is completed, but before the Central Artery viaduct has been removed, two of the existing on- and off-ramps to Storrow Drive will be removed and replaced to complete construction of the new Storrow Drive ramp system. The first three months of this period will be critical because all of the vehicles which formerly used these ramps will be forced to use alternative routes. Of the two ramps, the most critical i

ıe southbound Central Artery off-ramp ɔ Storrow Drive, whose three month losure will cause major traffic iversions and disruptions on potenial detour routes. These routes are xpected to include Interstate Route 3 southbound to Sullivan Square, utherford Avenue, and the Gilmore ridge to the Charles River Dam, and ystic Bridge to City Square to utherford Avenue. The Massachusetts urnpike will also be a major reroutng alternative for much of this raffic bound to and from the downtown oston area. Diversions to the assachusetts Turnpike will increase raffic on the Central Artery between torrow Drive and the Massachusetts 'urnpike. While the Central Artery ill have the increased capacity of wo additional lanes (a total of four n each direction), some peak period ongestion will likely occur. Likeise, much of the eastbound traffic rom the Storrow Drive off-ramp to the orthbound Central Artery which must e rerouted due to closure of that amp for about a year will be able to se the alternative Massachusetts Turnpike routing in the reverse irection. During the preliminary esign phase, refined construction staging techniques will be developed o minimize both the impact and uration of this ramp closure. Once his ramp is reopened, major construcion traffic impacts will cease in his area.

Logan Airport (East Boston)

Construction at Logan Airport and East Boston with the Preferred Alternative is to proceed concurrently with construction activities in South Boston to assure that the Third Harbor Tunnel is available when lane closures on the Callahan/Sumner Tunnels are required as described above.

Construction of the cut-and-cover tunnel section through Airport property will require both the main Airport access and egress roads as well as the Cross Road to be replaced by temporary roads of similar capacity for short periods of time, resulting in minor delays to traffic. Otherwise, traffic to and from the Airport will generally be maintained. All construction at Logan Airport is expected to be completed by 1991.

Public Transportation

No-Build Alternative

The No-Build Alternative should have minimal impacts on public transportation services during redecking. Only public and private bus carriers who use the Central Artery would be affected. As indicated earlier, a 33 percent reduction in Central Artery capacity at the High-Level Bridge (5-10 percent reduction south of Causeway Street) would cause significantly increased delays and longer travel times for buses. Except for the reconstruction of the Summer Street Bridge over the Conrail yards, the No-Build Alternative does not affect bus services in South Boston.

Preferred Alternative

It is probable that ridership on all MBTA rapid transit lines serving downtown Boston will increase during construction of the depressed Central Artery. Many motorists who have the option will divert to transit because of increased delays to automobile traffic.

Red Line Rapid Transit. Operation of the MBTA's Red Line service under the Fort Point Channel will be affected by construction of the Preferred Alternative. Construction of the Herald Street Extension above the MBTA Cabot Yards will require the temporary relocation of about four tracks. Service will be maintained on replacement tracks. Appropriate rail speed restrictions will be in effect during construction, as required. Generally, the Red Line impacts will be minimized by a requirement that any sensitive construction be accomplished during night periods (e.g., 1:00 to 5:00 AM) when the rapid transit line does not operate.

Blue Line Rapid Transit. Construction of the Preferred Alternative will, however, cause some slight disruption to Blue Line service in East Boston as a result of the need to relocate approximately 1000 feet of track immediately to the north of the ramps to and from Logan Airport. Service disruptions will be minimized since tie-ins and final connections will occur during night-time (no service) or weekend (off-peak) periods.

In downtown Boston, the depressed Central Artery will pass directly over the Blue Line tunnel under State Street. Disruptions brought about by interior tunnel strengthening will again be minimized by a requirement that all sensitive construction occur during night periods when there is no Blue Line service.

Orange and Green Lines Rapid Transit. Both the MBTA's Green and Orange Lines are located adjacent to the Central Artery in the North Station/Haymarket Square area. At the Haymarket portal, a temporary ramp passing over the Green Line is to be constructed to serve traffic diverted from the closure of the New Chardon Street ramp. An MBTA power substation now under construction may be affected by this temporary ramp. Every attempt will be made to minimize the impact this ramp will have on the substation. It is not expected that service on either the Green or Orange Lines will be directly affected by construction of a depressed Central Artery in that location. Also, a replacement parking facility may be built in this same Canal/Haverhill Street area by the MBTA. No major disruptions to MBTA service are expected during the construction of this garage.

Bus Services. The Preferred Alternative's construction within the Fort Point Channel will temporarily reduce the capacity of the bridges across this waterway. Several MBTA local bus routes use these bridges to provide service between South Boston and other locations. These routes will be affected by construction with detours to temporary bridges as necessary. Increased delays due to increased congestion will result in overall degradation in the quality of bus service in South Boston during the construction period.

Within downtown Boston, it is expected that express bus services, in particular, will experience an increase in ridership during construction of the Preferred Alternative.

The MBTA operates numerous local and regional bus routes within downtown Boston. Many of these routes will be disrupted during construction of the depressed Central Artery, particularly those serving the Haymarket Square area. These disruptions will arise from increased traffic congestion in this area caused by construction, resulting in delays and longer trip times, as well as from possible changes in routings due to various roadways being taken out of service either temporarily or permanently. Some delays or reroutings of services provided by other bus companies which use the Southeast Expressway and/or the Central Artery can also be expected during construction.

Within East Boston, service of MBTA express bus routes which utilize Route 1A will be subjected to additional delays in the vicinity of Logan Airport while ramp and roadway construction proceeds.

Airport Bus, Limousine, and Taxi Services. Additional delays to traffic entering or leaving Logan Airport can be expected during the construction of the Preferred Alternative. The main access roadways and ramps will remain open at all times, although temporary detours or capacity (width) restrictions will be required.

Passenger Rail Services. Construction in the South Bay area will require the temporary relocation of several railroad tracks near the interchange of the Central Artery with the Massachusetts Turnpike. These tracks are used for both local com-

muter rail and long distance Amtrak services at the South Station Transportation Center. Tie-ins of the temporary detour tracks will be made during periods of little or no scheduled train service, such as at night or on weekends, in order to keep any disruptions of service to an absolute minimum.

At North Station, while construction of new ramp connectors between the Central Artery and Storrow Drive proceeds under the ten existing tracks, it will be necessary to construct seven new tracks for temporary use by the MBTA/B&M Railroad. A minimum of ten tracks will be available to the MBTA/B&M Railroad at all times. Again, service disruptions should be minimal since all connections to these temporary tracks will be made during periods of little or no commuter rail service.

Ferry Services. No delays to the commuter ferry services provided within Boston Harbor are anticipated as a result of the construction of the Preferred Alternative. It is likely that vehicular delays caused by construction of the Preferred Alternative (as well as the No-Build Alternative) will increase patronage on ferry services during roadway construction. It may be necessary for the ferry companies to schedule additional trips in order to accommodate the expected patronage increase.

4.2.10 Parking Impacts

This section inventories the parking areas that will be taken with the No-Build and Preferred Alternatives. Impacts are listed in terms of temporary and permanent takings. Discussions of temporary takings indicate the construction year(s) when specific lots will be closed to parking; upon completion of such work parking can be restored. With the exception of parking under the existing Central Artery (primarily along the Surface Artery), legal on-street parking is not included at this time due to a lack of definitive construction detour routes. For the Preferred Alternative, this section also notes the anticipated construction year when the full or partial permanent takings will occur, and the duration of any temporary takings. As noted in previous sections, construction is expected to begin by September 1986. Mitigating measures are discussed when applicable. Because most lots are not delineated by parking lanes, lot capacities are approximate to the nearest ten. More detailed discussions of these parking impacts, and mitigating measures, are contained in Section 4.4 LAND USE IMPACTS.

No-Build Alternative

Temporary Takings. The No-Build Alternative would affect ten parking lots located under the Central Artery (nine serve the general public and a 20-space lot is used by City of Boston employees). Jointly, those lots accommodate 700 lot spaces and 90 metered spaces. It is expected that not all of the lots would be affected at the same time, but all would be closed to parking at some time during the three-year construction period required to redeck the Central Artery.

Permanent Takings. There are no permanent parking takings.

Preferred Alternative

South Boston

Temporary Takings. The following lots will lose parking spaces during the first two years of construction: A lot operated on Boston Wharf Company property accommodating up to 700 cars will lose 220 spaces, the U.S. Postal Service lot with 1630 spaces will lose 460, and 130 spaces will be taken from the Gillette Corporation. Half (about 130 spaces) of a lot at the Boston Marine Industrial Park (BMIP) will be taken for a 12 to 18 month period. Additionally, the McCourt Property and the Solomon parking lot, with 80 and 100 spaces respectively, will be closed to parking during the first three years

Street lot (2 parcels) - 70 spaces; and North Washington Street lot - 60 spaces. The two lots bordered by the following streets will be taken during the third year of construction: Endicott Street/Stillman Street lot - 20 spaces; and Cooper Street/Stillman Place lot - 20 spaces. Thirty metered on-street spaces, spaces for 20 fish and produce trucks which park under the existing Central Artery on Fridays and Saturdays when Haymarket is open, and a 20-space lot operated under the Artery by the City of Boston's Public Works Department for city employees will be taken.

Mitigating Measures. The Commonwealth is committed to ensuring the availability of parking for North End residents and visitors and will provide permanent parking facilities prior to displacing the approximately 370 lot spaces taken under the Artery.

Prior to their being displaced, all lot spaces taken by the project will be replaced at locations such as in a new garage above state-owned property in the vicinity of Haverhill and Canal Streets (above the MBTA's Orange and Green Lines), or possibly on city-owned property lying between Fulton Street and the approach to the Callahan Tunnel. Other parking options under consideration include an agreement to allocate space at nearby garages (i.e., Quincy Market Garage, Harbor Tower Garage, Hertz Garage, Government Center Garage) for North End residents and visitors, and providing (via MBTA or a private service) shuttle service between various parking garages and the North End. These possibilities will be pursued with the appropriate owners during the design phase to guarantee adequate replacement parking for North End residents and businesses.

To mitigate impacts on Haymarket vendors, truck storage space will be provided in the immediate area, both during and after construction. Areas near the construction corridor, such as BRA parcel 7 or an area adjacent to Waterfront Park, may in part be designated for this use.

North Station

Temporary Takings. The Spa[illegible] ing Rehabilitation Hospital will l[illegible] 80 spaces and the state-owned lot (currently used by MDPW employees [illegible] Registry of Motor Vehicle employee[illegible] will lose 100 spaces during the fi[illegible] and sixth years of construction. Fifty spaces will be taken from th[illegible] Massachusetts General Hospital par[illegible] lot during the tenth year of const[illegible] tion.

Permanent Takings. Two lot[illegible] located under the existing Central Artery and fronting on the followi[illegible] Streets will be taken in the first year of construction: Causeway Street lot - 120 spaces; Haverhill Street lot (one of two parcels) - [illegible] spaces. The Beverly Street lot (a[illegible] under the Central Artery) - 70 spa[illegible] will be taken in the third year of construction. A parking lot behin[illegible] the Anelex Building accommodating [illegible] vehicles is also taken by the proj[illegible] during the first year of construction. Twenty spaces from the MDPW parking lot on Nashua Street are t[illegible] in the fifth year of construction.

Mitigating Measures. As a result of the planned relocation o[illegible] the MDPW to the new State Transpor[illegible]tion Building, the demand for stat[illegible] vehicle or employee parking in thi[illegible] area may be reduced. Because of t[illegible] anticipated reduced demand and exc[illegible] supply on this state-owned parcel, temporary parking for the hospital may be accommodated at this site.

The spaces taken at the Cau[illegible]way Street lot, Beverly Street lot and that portion of the Haverhill Street lot affected by the Preferr[illegible] Alternative will be replaced prior [illegible] their being displaced, possibly through the parking garage previou[illegible] mentioned or through agreements wi[illegible] other garage owners.

Logan Airport

Temporary Takings. There a[illegible] no temporary takings.

construction.

Permanent Takings. In addition to the area taken during the construction period only, the Boston Wharf Company will lose an additional 30 spaces due to an open cut tunnel segment on its property and the U.S. Postal Service will lose approximately 40 permanent spaces. The Gillette Corporation will lose 40 spaces. These permanent takings will also occur in the first year of construction.

Mitigating Measures. A temporary parking lot at Boston Marine Industrial Park will replace the spaces lost temporarily at BMIP. The lot may be provided on sites such as the one in the western portion of the container shipping area which Massport plans to construct (if it is not in use for containerport activities).

Construction-period parking replacement for the Postal Service could be provided through short-term use of designated parking spaces in the South Station Transportation Center garage. In the long term, this parking will be replaced on sites near the existing parking area. It is expected that the private sector market for commuter parking will spur earlier development of other proposed parking structures in South Boston, which could accommodate other privately-owned, publicly available parking areas in South Boston displaced by the project.

Fort Point Channel

Temporary Takings. Construction impacts will result in the loss of 100 spaces from Boston Edison property and the closing of the 50-space lot adjacent to Russia Wharf during the second and third years of construction.

Permanent Takings. Approximately 25 on-street angle parking spaces between Summer Street and Congress Street on Dorchester Avenue will be replaced by about 15 on-street parallel spaces.

Mitigating Measures. Impacts caused by loss of parking spaces will be offset in part by the development at Rowes/Fosters Wharf which will include a parking facility, expected to be completed in 1987, and by the addition of public parking at the South Station Transportation Center, due to be available in 1989.

Financial District/Waterfront and Adjacent Areas

Temporary Takings. There are no temporary parking takings.

Permanent Takings. A 70-car lot in the Financial District located under the existing Central Artery and bounded by Purchase Street, High Street, and Atlantic Avenue, and 60 metered on-street spaces serving the Financial District and Waterfront areas (and also serving the Haymarket and adjacent areas on weekends) will be permanently taken by the project in the first year of construction.

Mitigating Measures. The displaced lot spaces will be replaced by the project and are briefly discussed below under North End and Adjacent Areas and in Section 4.4 LAND USE IMPACTS.

North End and Adjacent Areas

Temporary Takings. There are no temporary takings.

Permanent Takings. Several lots located under the existing Central Artery serving the North End and other adjacent city neighborhoods or areas including Haymarket, Quincy Market, the Waterfront, and Government Center, will be taken by the project in the first year of construction. As discussed below under Mitigating Measures, replacement parking for the surface lots serving the general public will be provided by the project prior to the loss of the existing spaces. The existing lots are bordered by the following streets: Blackstone Street/North Street/Cross Street lot - 200 spaces; North Washington Street/Cross Street/New Chardon

Permanent Takings. Sixty spaces serving the Delta Reservations Center, 60 serving the American Airlines hangar building, and 50 serving the Williams Air Freight employee parking area will be taken in the first year of construction. No other takings exclusively accommodating parking uses result.

Mitigating Measures. Parking displaced by the project will be replaced on Airport lands to be determined in consultation with Massport.

4.3 RELOCATION IMPACTS

In the discussions which follow, all references to acquisition of properties or buildings refer only to those properties or buildings whose tenants'/owners' businesses will be displaced by the proposed project. Other property acquisitions will occur as part of this project, but will not involve business displacements. Where mitigating measures are necessary to ensure the continuance of business operations during the construction phase, they are discussed in Section 4.4 LAND USE IMPACTS of the FEIS. Appendix 2 - CONCEPTUAL RELOCATION PLAN REPORT elaborates on the relocation requirements of the Preferred Alternative.

4.3.1 Comparison of Alternatives

The relocation impacts of all alternatives considered during the EIS process are summarized in Table 42 and discussed briefly below.

- No residential properties would be acquired for any of the alternatives; therefore, no residential relocations would be necessary.

- The Preferred Alternative necessitates 31 partial or total takings. This alternative displaces 131 businesses and public agencies, affecting 4,400 employees. Tax losses per year are estimated at $767,000. This alternative takes the most businesses and has the most impacts on relocation of manufacturing and distributing businesses.

- Alternatives 3A and 5A woul cause the next largest relocation impact. Partial or total takings range from 23 to 27; 108 to 111 businesses or agencies would be displaced. The number of employee affected by business displacements range from 3,420 to 4,570, and tax losses are in the vicinity of $750 per year.

- Alternative 6 would require partial or total takings and would displace 89 businesses and agencie 2,880 employees would be affected, annual tax losses are estimated at $685,500.

- Alternatives 2, 3, 4, and 5 would have fewer takings overall, primarily because the Anelex build is not acquired (the Anelex buildi accounts for 62 businesses and 2,2 employees.) Partial or total taki range from 8 to 12; 14 to 24 businesses or agencies would be displaced. The number of employees affected by business displacements ranges from 170 to 510.

- The No-Build Alternative an Alternatives 2, 3, 4, and 5 would temporarily affect the nine parkin lots located under the Central Artery. It is expected that not a of the lots would be affected at t same time, but all would be closed parking at some time during the three-year construction period required for redecking of the Centra Artery.

- Alternatives 3A, 5A, 6 and Preferred Alternative would requir that the nine lots under the exist Central Artery be permanently take Provisions for replacement parking the Preferred Alternative are discussed in Section 4.4 LAND USE IMP

Table 42

RELOCATION IMPACTS

Alternative	Businesses Displaced	Partial & Total Takings*	Employees Affected
2	16	12	245
3	24	9	510
3A	108	23	4570
4	14	11	170
5	22	8	440
5A	111	27	3420
Preferred Alt.	131	31	4400
6	89	14	2880

* These takings refer only to property and/or business acquisitions requiring displacements and relocations. Additional parcel acquisitions for right-of-way are not included.

.3.2 Displaced Businesses and the Availability of Comparable Relocation Space

This section identifies the usinesses affected by the Preferred lternative and reviews the availabil-ty of comparable relocation space for hose affected. The description does ot cover situations in which impacts n specific properties from construc-ion, either temporary or permanent, re not anticipated to result in a ermanent displacement. Included in his category are the Turner Fisheries roperty and the Boston Marine Indus-rial Park. These situations are escribed in Section 4.4 LAND USE MPACTS.

rea North of Dewey Square

The Anelex Building (see Figure 1, #1) at 150 Causeway Street, with 2 tenants and 2,200 employees, ccommodates primarily office space on ts upper floors and retail space at round level. Approximately half of he tenants are governmental agencies nd half are private businesses. The roperty also includes a 440-car surface parking lot in the back (see igure 31, #1A).

The Boston Garden, located next to the Anelex Building on Causeway Street, will not be taken; however, it leases 39,200 square feet of space at the Anelex Building and depends on the availability of office and storage space. In addition, truck deliveries to the Garden pass through the Anelex Building via a ramp from the Anelex parking lot to the building's second floor and then through an enclosed above-grade passageway between the two buildings. The Anelex taking requires that relocation space and comparable delivery access be provided for the Boston Garden to ensure that none of its operations are disrupted.

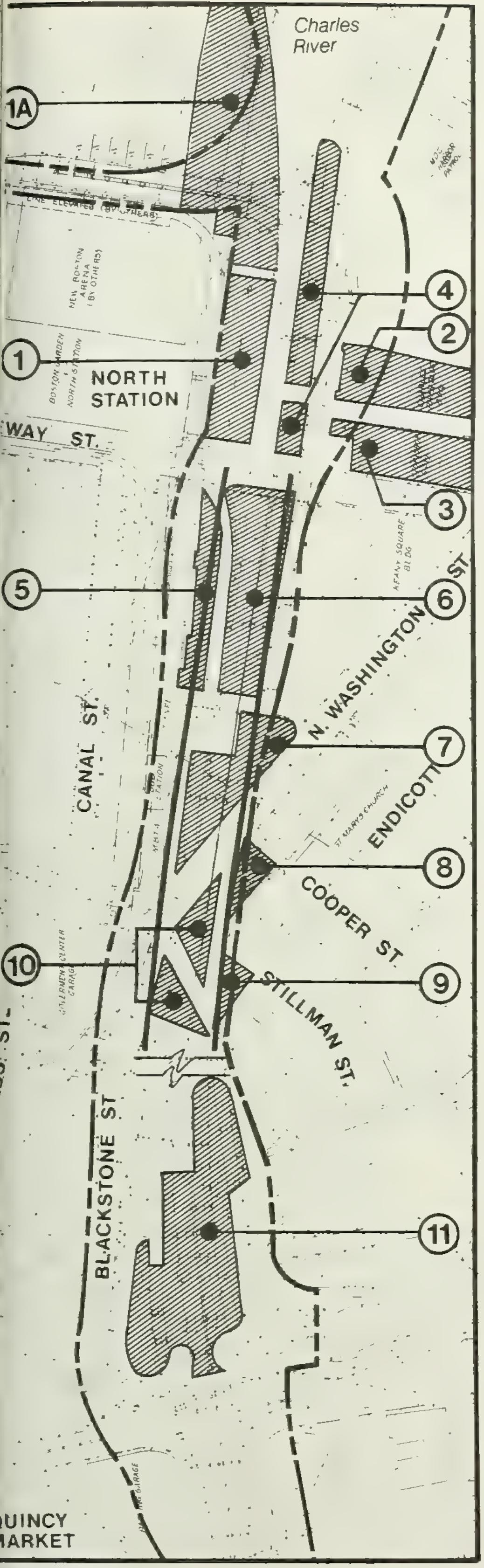
The Anelex Building represents one of the largest concentrations of Class B/C office space (a rating which indicates that the building is old, does not offer "first class" office space, and therefore has more competi-tive rents) in the Central Business District. There is not a great deal of such space at competitive locations to handle all of the required reloca-tions from this building. However, there are a number of building conver-sions in less competitive locations which are anticipated, especially in the Fort Point Channel area and lower

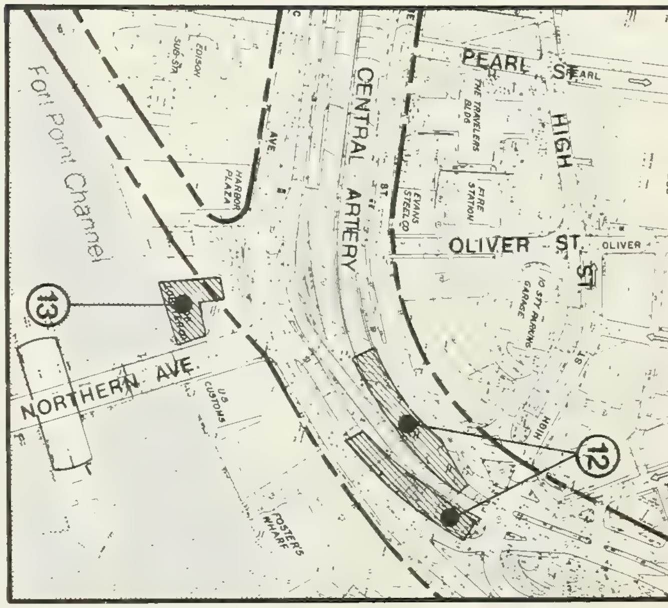
Washington Street. Other buildings in the North Station area are also being converted from current uses such as storage, showroom, or manufacturing space to office space. While there are no specific relocation areas in the North Station area to accommodate the 440 car lot, in the long term some of the spaces could be replaced by building a garage on State-owned property in the vicinity of Haverhill Street (above the MBTA Orange and Green Lines). In addition, Phase I of the North Station Development plans call for parking to serve the North Station area.

In addition, the building's largest tenant, the U.S. Coast Guard, is scheduled to move to the U.S. Customs Building on Atlantic Avenue upon completion of that structure's renovation. The Small Business Administration may also relocate to this building. Adequate federally-owned office space is expected to be available to accommodate federal offices in the Anelex Building which are displaced by the project. This space could include the 11-story, 602,000 square foot (sf) federal office building, currently under construction at North Station. The Registry of Motor Vehicles may also relocate to the Registry's main facility at 100 Nashua Street in Boston in the future. The Registry, and federal agencies with relocation options which include moving to government buildings, will reduce the amount of competition faced by tenants desiring to move to comparable space in privately-owned buildings.

The <u>Charles River Building</u> (see Figure 31, #2) at 131 Beverly Street houses eight manufacturing or warehouse businesses. Relocation space is readily available in Boston for tenants in this building since the market for mill-type industrial space in Boston is very active, especially in the South Boston/Fort Point Channel area. Design modification work now underway suggests that a ramp redesign in the area may obviate the need to take this building.

The <u>Stop and Shop Bakery</u> (s Figure 31, #3), a manufacturer and distributor of bakery goods employ approximately 300, is listed as a displaced business throughout this report and the SDEIS/SDEIR, althou the Preferred Alternative will aff only a small portion of the proper Stop and Shop has recently announc that the bakery will be relocated, independent of this project. The building will be available for a number of other possible uses with lesser loading requirements. The bakery currently uses the entire six-story facility at 226 Causeway Street in the North Station area f the manufacture of bakery goods an their region-wide distribution. W the exception of the building's one-story loading area which juts from the building's northwest corn, the remainder of the building itse is not affected. The Preferred Alternative takes this loading are It appears, however, that an acces road could be built from North Washington Street to the north of building (using part of the presen Charles River Building site) with temporary loading dock area provid also in this area, which could per the Stop and Shop Bakery (or anoth business) to remain in operation. this is not determined to be acceptable to the Stop and Shop Co (or a subsequent tenant) during th design phase, then truck distribut of goods, a vital part of the business' operation, would be difficult or impossible during construction. Relocation of this business (or a subsequent tenant) cannot be ruled out at this time, therefore, owing to the uncertaint maneuvering numerous large trucks the relocated loading area, and decisions by the owner regarding t suitability of mitigating measures There are a number of industrial sites, both freestanding and in industrial parks, to which the Sto and Shop Bakery might relocate. W there are few existing facilities appropriate parcels upon which to build within the Route 128 area, numerous parcels are available





Legend

1	150 Causeway St.	Primarily Office, some Storage & Retail (62)
1A	150 Causeway St.	Parking
2	131 Beverly St.	Primarily Manufacturing & Warehouse
3	226 Causeway St. (Loading Dock Only)	Bakery Manufacturing & Distribution
4	Beverly St. Lot (proposed)	Parking
5	Haverhill St. Lot (1 of 2 parcels)	Parking
6	Causeway St. Lot	Parking
7	North Washington St. Lot	Parking
8	Cooper St./Stillman Place Lot	Parking
9	Endicott/Stillman Street Lot	Parking
10	N. Washington/Cross/New Chardon Street Lots (2)	Parking
11	Blackstone/North/Cross St. Lot	Parking
12	Purchase/High/Atlantic St. Lots (2)	Parking
13	15 Northern Ave.	Lobster Wholesale, Retail

Note: Numbers in parenthesis indicate the number of businesses displaced, if more than one

Proposed Project Construction

Business Relocation

Approximate Tunnel Wall

Figure 31
Relocation Requirements
Area North of Dewey Square

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

throughout the Interstate Route 495 area which are appropriate and provide convenient regional access.

Nine publicly-owned parcels used as parking lots (owned primarily by the City of Boston and also by the MDPW) are taken below the Central Artery. About 30 employees are affected (see Figure 31, #'s 4 - 12). The parking lot operators run several lots or other businesses, so the possibility exists for employee transfers. Most of the lots are run by operators who bid for them on a yearly basis, and lease agreements stipulate a 30-day or 24-hour notice to terminate. Therefore, these employment opportunities are already short-term in nature.

Hook Lobster at 15 Northern Avenue, with 15 employees, is a lobster retailer and distributor (see Figure 31, #13). There is ample vacant land available with water frontage on Reserved Channel at King Industrial Park to accommodate this facility.

South Boston/South Bay Areas

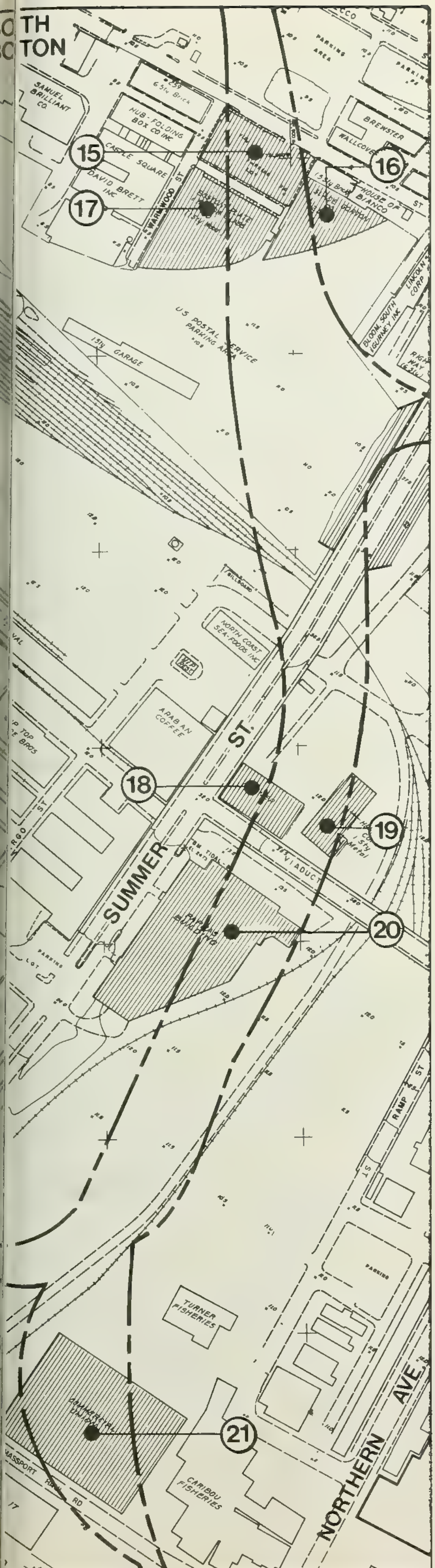
In the South Bay area, the Rapid Service Press Building at 375 Broadway accommodates a printing and warehouse business employing a total of 75 employees (see Figure 32, #14). Tenants at this building should be able to find comparable space within close proximity of their existing locations.

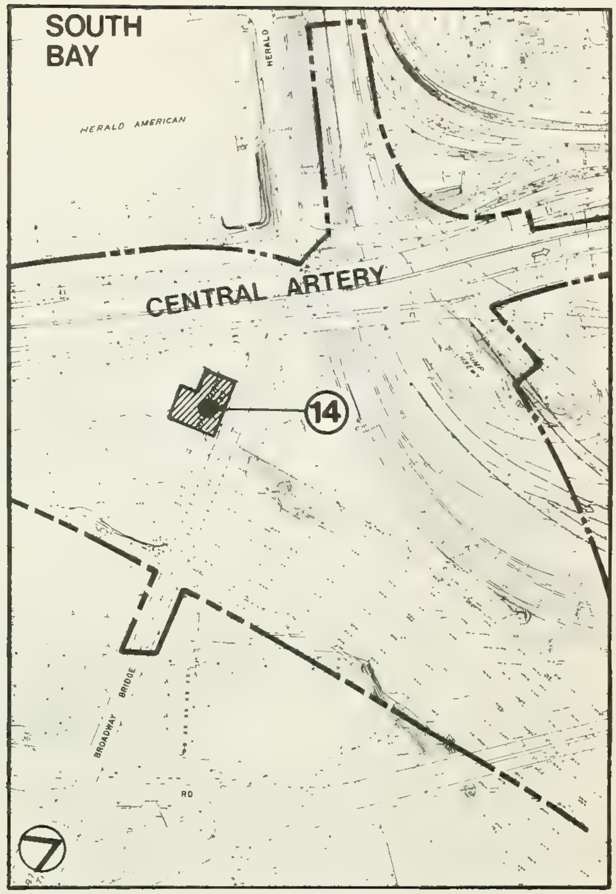
In South Boston, the Solomon Parking Lot has two part-time employees (see Figure 32, #15). Slade Gorton Company at 295 A Street (see Figure 32, #16) is a wholesaler and distributor of frozen fish with 65 employees. Boston Plate and Window Glass, which occupies a building at 40 Wormwood Steet, is a glass and metal fabricator employing 15 people; a tenant at the same address produces wooden skids and employs two persons (see Figure 32, #17). The Harding Company at 335 B Street Extension, with 16 employees, is a supplier and manufacturer of hoisting and rigging equipment (see Figure 32, #19). Noymer Manufacturing Company at 43 Summer Street (see Figure 32, #18) 75 employees who manufacture or produce leather goods. The Pappas Building at 440-450 Summer Street supports six tenants involved in office, sales, manufacturing, or warehousing and distribution activ- ties (see Figure 32, #20). A tota 167 employees work at the Pappas Building. The Commercial Union Insurance Company at 30 Trilling W with 67 employees, provides shippi warehousing, and printing services its Boston area offices (see Figur 32, #21).

There are a number of possil relocation resources for these off manufacturing, processing, and warehousing concerns. Examples of space include vacant buildings on Summer and Wormwood Streets, such 290,000 sf at the former Hub Foldi Box Company on Wormwood Street (3 buildings); 90,000 sf of space at Morton Shoe Building on Summer Str approximately 800,000 sf now being leased by the Economic Development Industrial Corporation of Boston (EDIC) at the new industrial cente the former Boston Army Base. Plar also call for redevelopment of an additional 825,000 sf at Building by one or more private developers the Army Base under EDIC auspices.

The Boston Marine Industria Park and the Boston Army Base are owned by EDIC. During recent coor- nation meetings with EDIC, the age indicated its intent to make every effort to find a place for busines displaced by the project in one of industrial parks or at suitable locations within the City.

There is currently no vacan land for sale or lease within the immediate neighborhood of Solomon Parking. The area is desireable t investors and speculators for futu development, and parcels being hel for development are already being on an interim basis for off-street parking or other uses. It is unli that this business can be relocate





Legend

14	375 Broadway	Printer/Warehouse (2)
15	275 A Street	Parking
16	295 A Street	Fish Distributor
17	40 Wormwood St.	Glass/Metal Fabrication; Wooden Skid Manufacture
18	430 Summer St.	Manufacturer/Importer of Leather Goods
19	335 B St. Extension	Hoisting/Rigging Manufacture & Retail
20	440 – 450 Summer St.	Office/Manufacturing/ Warehouse (7)
21	30 Trilling Way	Warehouse/Manufacturing

Note: Numbers in parenthesis indicate the number of businesses displaced, if more than one

Proposed Project Construction

Business Relocation

Figure 32
Relocation Requirements
South Boston/South Bay Areas

0 100 200 400 Feet

within its present neighborhood.

East Boston/Logan Airport

The Eastern Reservations Building (see Figure 33, #22) has 430 employees, and accommodates Eastern Airlines reservations operations for all of New England and upstate New York, and the Continental Airways Sales Office, with 4 employees. It may be possible to underpin the Eastern Reservations Center during construction. If it proves more convenient to relocate the operation prior to construction to a new site immediately adjacent to the existing site, this will be considered.

The General Aviation Building (see Figure 33, #23), with a total of 59 employees, provides office space for an FAA office and the National Weather Service, storage space for Aerial Photos International, and space for a snack bar. The Eastern Air Freight Building, Hill Air Cargo Building, and Central Air Freight Terminal (see Figure 33, #s 25, 24, and 29, respectively) provide space for 22 businesses involved in some aspect of freight forwarding, jointly employing 244 employees. The National Car Rental facility (see Figure 33, #26), with 120 employees, supports an administrative building, a facility for minor car repairs, and lot space. Hertz Rent-A-Car (see Figure 33, #27) operates an express car rental facility with eight employees. The Exxon Service Station (see Figure 33, #28), with 14 employees, provides a full range of automotive services. The United Airlines Flight Kitchen (see Figure 33, #30) employs 70 persons and provides catering services for United Airlines and other airlines.

A partial taking at the Robie Airport Park (161 Prescott Street) adjacent to Logan Airport in East Boston will affect two businesses: an Avis car maintenance facility, and Federal Express. In addition, an annex which is usually occupied by an airport-related tenant, but is currently vacant, will also be taken. It is uncertain if the taking is significant enough to require that all of existing businesses be relocated, although the property owner insist that his tenants not be interviewe unless the project were certain to proceed.

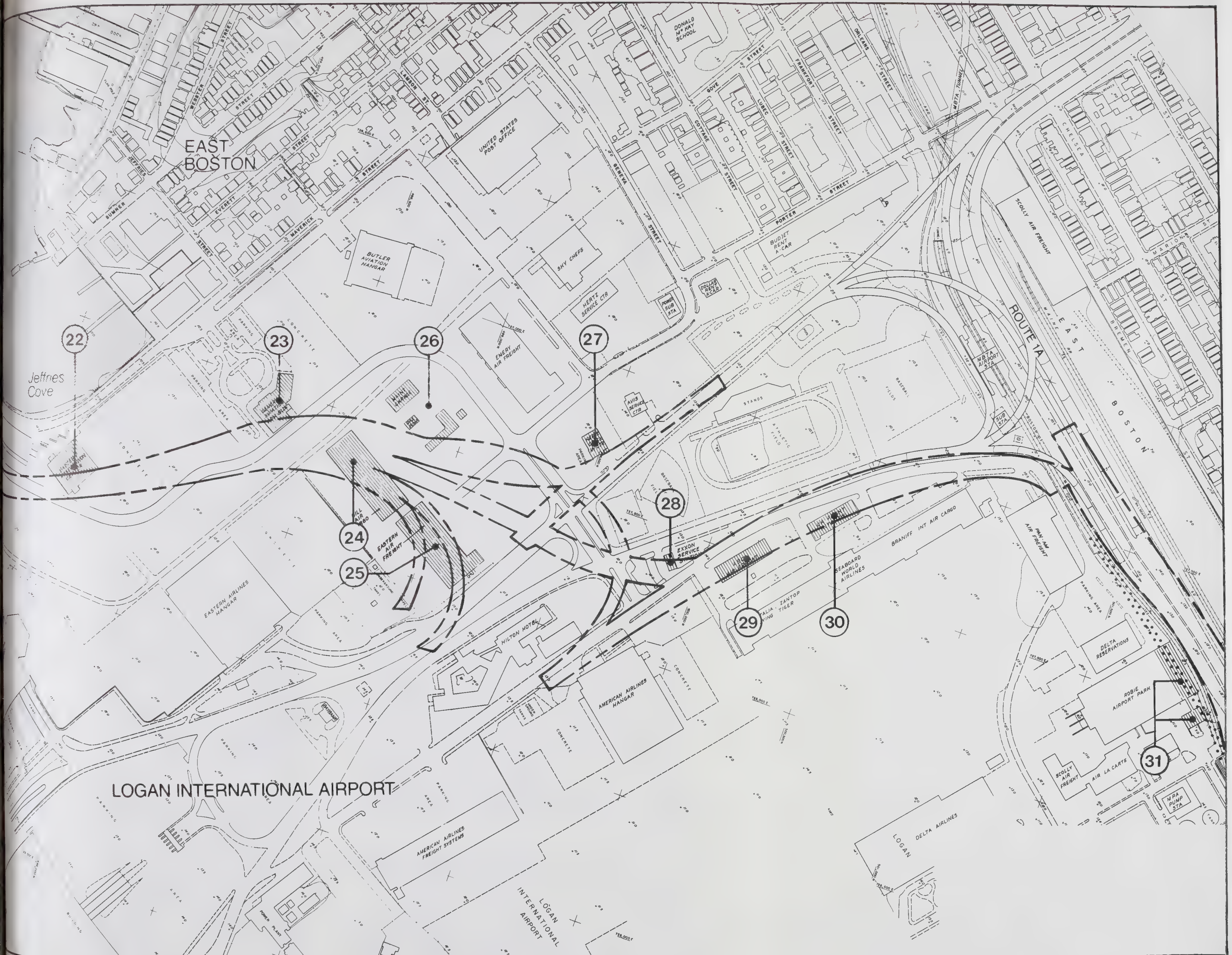
Massachusetts Port Authorit has stated a priority intention to facilitate the continued operation affected airport businesses on alt-nate sites on Airport property, or other appropriately zoned industri areas. Massport has several poten relocation sites: portions of sti undeveloped land at Bird Island Fl (BIF), 6-12 acres on the north sid the Airport near Neptune Road, and about 8 acres in the Airport's sou-west Section.

Most of the other businesse would prefer and/or require an air location. Space will be available BIF to accommodate the freight forwarding businesses (ultimate Massport plans include 440,000 square of such space at BIF). Massport i also considering the expansion of cargo facilities in the north area the Airport. Costs to rent or bui new facilities at these sites coul higher than current rents, thereby posing a problem for some existing tenants.

The freight forwarding busi at Robie Airport Park has the same relocation options as those forwar businesses located at the Airport. Space is available along Route 1A the relocation of the Avis car mai nance facility should it prove nec-sary for these businesses to reloc

4.3.3 Related Business Economic Impacts

Despite the availability of replacement property and other rel tion benefits which are discussed the end of this section, it is usef to note some particular concerns identified during interviews relate to business displacement. It is difficult to do a more systematic analysis of the cost differential relocated businesses may experience



Legend

22	Logan Airport	Flight Reservations; Office
23	Logan Airport	Primarily Office (4)
24	Logan Airport	Freight Forwarders (12)
25	Logan Airport	Freight Forwarders (3)
26	Logan Airport	Car Rental
27	Logan Airport	Car Rental
28	Logan Airport	Service Station
29	Logan Airport	Freight Forwarders (7)
30	Logan Airport	Flight Kitchen
31	161 Prescott St.	Freight Forwarder; Car Maintenance

Proposed Project Construction

Business Relocation

Relocated MBTA Blue Line

Note: Numbers in parenthesis indicate the number of businesses displaced, if more than one

Figure 33
Relocation Requirements
East Boston/Logan Airport

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

because owners are reluctant to reveal their expense portfolios at the conceptual stage of such a project.

Longer-term property owners with favorable (if any) remaining mortgage payments will experience significant cost increases if they choose to construct a new building to specification. Present tenants with advantageous long-term leases will probably experience an increase in rents as a result of having to negotiate a new contract elsewhere. For example, Spencer Shoe has been in the Pappas Building since its construction in 1962; the business had a 20 year lease with a 16 year option to renew. Rent anywhere else would likely be significantly higher than the current rent level. Other long-term renters who modified their properties may not be reimbursed for improvements unless specific measures were stipulated in lease agreements.

Impacts may be most severe for some of the manufacturing and warehouse businesses located in South Boston: Wardrobe Maker, Noymer, Harding, Slade Gorton, and Commercial Union Insurance Company. Unlike office furniture which can be moved quickly, manufacturing or warehouse businesses have heavy equipment or intricately stored material which cannot be moved easily, thereby creating the potential or likelihood for business disruptions during relocation. Possible halts in operations can be costly for individual businesses, and this type of loss is not covered by relocation benefits. These relocations are also very disruptive for businesses that ship nationwide and whose goods movement must be maintained while such a move is in progress.

Because such businesses contribute to the diversity of Boston's economic base, it is important to consider the provision of special incentives to businesses to help them recoup any losses and to ensure that they relocate in the immediate area (which most of those interviewed appeared to prefer). This may be encouraged by specific initiatives taken at the city level such as tax abatements, low interest loans, and the provision of technical assistance. These options will be explore in the design phase.

It is also important to give much notice as possible to businesse which will have to relocate. Based interviews with the business represe tatives, it is estimated that at lea 18 months to 2 years following property acquisition will be needed to carry out a timely and orderly reloc tion program. This time is necessa to enable some of the businesses to negotiate land purchases or leases, build to required specifications, a to schedule the move at a time when will be least harmful.

4.3.4 Community Economic Impacts

Property takings of the Preferred Alternative, requiring the relocation of businesses along the alignment, result in a total munici tax loss of up to $767,000 a year. However, long-term impacts of the proposed project on local property taxes are estimated to include a $5-$10 million annual property tax benefit after full absorption of th 2.75 million sf of air rights devel ment, excluding parking and open sp that is expected to become availabl above of the depressed Central Artery. In addition, a $20-$30 million one time receipt (not annua will result because of a faster absorption of space in new South Boston developments (see Section 4. ECONOMIC IMPACTS).

As noted previously, this EIS/EIR has assumed displacement of the Stop and Shop Bakery, a conservative assumption at this tim since the company has already announced its intentions to cease activity at this location. Because the company's decision, there is th possibility of job losses among a portion of its 300 employees. Simi employment opportunities may be difficult to find in a city where manufacturing jobs are being replace

y service and other office jobs. The effect of this decision on the community should not be attributed to the proposed project.

Of the nine parking lots taken under the Central Artery, the taking of the lot bordered by Blackstone, Cross, and North Streets may cause the most adverse economic impacts because of its convenient location to North End activities. If comparable space during weekdays is unavailable some people may be discouraged from dining or shopping in this area upon removal of this lot. As noted previously, however, the Commonwealth is already exploring other parking alternatives in order to avoid adverse economic impacts to this community and has made a commitment to provide replacement parking prior to the commencement of construction. Plans for replacement parking are discussed in Section 4.4 LAND USE IMPACTS.

For the remainder of the takings in the central area, South Bay, and South Boston, numerous locations near the existing businesses are available; therefore, adverse economic impacts are not expected to result. In South Boston manufacturing and industrial jobs are actually expected to increase due to the current redevelopment of space at the Boston Army Base and due to roadway improvements built as a result of the Preferred Alternative. These improvements will also increase revenues in the long term.

In East Boston there are no significant community economic impacts because it is anticipated that most businesses would relocate at the Airport, thereby preserving existing jobs for East Boston residents.

The relocation interviews conducted for this study indicate that the number of minority-owned businesses to be relocated by the project is negligible. The percentage of minority employment at Logan Airport is lower than for the City of Boston as a whole. Business relocations at the Airport are not expected to affect a significant number of these employees. Minority representation in certain areas, however, is higher. In South Boston, the number of minority employees affected by relocation is approximately 16 percent of the total affected work force. This percentage is comparable to the total number of employed minorities who reside in the City of Boston (18 percent).

4.3.5 Massachusetts Department of Public Works Relocation Procedures

A business relocation agent will be assigned by the MDPW to assist each relocating business in all phases of relocation and in the preparation of documentation required to process payment claims. The relocation agents will inform all business owners of their benefits and entitlements, courses of action which are open to them, any special provisions designed to encourage businesses to relocate within the city, and other public or private programs that may provide them with assistance.

Relocation Benefits

Depending on the type of ownership and the business options one chooses, displaced businesses are eligible for several payments:

1. Actual reasonable costs of moving and related expenses.

2. Direct loss of tangible personal property for items that are not moved and cannot be sold.

3. Actual reasonable expenses in searching for a replacement business, not to exceed $500.

4. A fixed payment in lieu of the payment for actual expenses and losses, not to exceed $10,000.

In addition, the property owners are reimbursed for the full fair market value of the business property. If any business or property owner has been denied a payment or

disagrees with a computed amount, an administrative appeal process is available through the Hearing Examiner of the MDPW.

Functional Replacement

FHWA policies provide for functional replacement of publicly-owned facilities displaced by the project where such replacement is in the public interest, as determined by consultation with FHWA. Functional replacement involves compensation beyond appraised market value of public property taken for highway projects if replacement cost exceeds appraised value. FHWA must approve actual replacement cost and review site selection design and construction. In the context of relocation, functional replacement may apply, for example, to the General Aviation Building at Logan Airport depending on the composition of its tenants at the time the building is acquired by eminent domain. See Appendix 2 CONCEPTUAL RELOCATION PLAN REPORT for a discussion of the building's current tenants. The applicability of functional replacement will be pursued further during the design phase.

4.3.6 Other Possible Sources of Assistance

Other potential resources to minimize economic harm to displaced business establishments, and to increase the likelihood of their remaining within city limits, were also explored. Sources contacted include state and local agencies; the U.S. Small Business Administration (SBA); Economic Development and Industrial Corporation of Boston (EDIC/Boston), Boston's Neighborhood Development and Employment Agency (NDEA); the Massachusetts Government Land Bank; and local banks. In some cases, the SBA will guarantee loans or issue a debenture in conjunction with other lenders.

Several other agencies have programs which could assist relocating businesses. These include:

- NDEA of Boston operates a program for retail and commercial businesses in nine targeted sections of Boston. For eligible businesses, the program provides loans at reduced interest rates for facade improvements or commercial development through participating commercial banks. This program also provides loan packaging and architectural assistance.

- EDIC/Boston assists in reviewing the financial needs businesses, provides direct loan packaging assistance or referral to other financial assistance programs, and maintains listings of available industrial sites including parks developed by EDIC, and information on Boston's labor force.

- Massachusetts Government Land Bank can sell or rent space businesses at below market interest rates. It may work directly with businesses or through EDIC/Boston.

In order to minimize inconveniences and impacts to businesses displaced by the project, the Commonwealth of Massachusetts will provide assistance to affected businesses in attempting to secure additional fun

4.4 LAND USE IMPACTS

4.4.1 Comparison of Alternatives

- The Preferred Alternative wi change land use in downtown Boston adding approximately 20 acres to th stock of land available for development. It will improve the environmental quality of downtown to such extent that there may be shifts in land use from less expensive Class office use and industrial/warehousi uses to prime Class A office, retai and possibly, residential use. Thi is consistent with the City's plann goals for downtown. Alternatives 3

nd 6 would have similar impacts.
No-Build Alternative and Alterna-
s 2, 3, 4 and 5 would not cause
ges in land use in downtown Boston.

The Preferred Alternative will
ve the barrier of the elevated
ral Artery which has dampened
ections between the Financial
rict and the Waterfront; connec-
s which are an important element
he City's development plans.
rnatives 3A, 5A and 6 would have
lar impacts. The No-Build Alter-
ve and Alternatives 2, 3, 4 and 5
d leave the Central Artery in its
ting configuration, thus maintain-
the barrier between these dis-
ts.

The Preferred Alternative will
a more positive impact on the
re land use of northern South
on because of the additional
rchange provided; it also involves
ter land takings in South Boston
other alternatives. Alternative
would have positive impacts on
thern South Boston, although access
rovements are less than those
ered by the Preferred Alternative.
ernatives 2, 3, 3A, 4, and 5 would
e lesser positive impacts on future
d use in northern South Boston; the
Build Alternative and Alternative 6
ld not have land use impacts on
thern South Boston.

The Preferred Alternative
flicts with some aspects of BRA and
plans in the North Station area.
re will be continued coordination
h these two agencies to minimize
impacts of the project. Alterna-
es 3A, 5A and 6 would have similar
acts. The No-Build Alternative and
ernatives 2, 3, 4 and 5 would not
fect plans in the North Station area.

The Preferred Alternative
nefits residential land use in East
Boston by improving access via the existing tunnels to the Central Artery northbound and Boston, and by reducing traffic on local streets. Alternatives 3A and 5A would have similar impacts. Alternatives 2, 3, 4 and 5 would cause improvements in access to the south and west from East Boston; improvements would be less significant to the north and northwest corridors. With Alternative 6, and to a greater extent with the No-Build Alternative, access from East Boston would degrade over time because of the lack of a Third Harbor Tunnel, and land use could shift away from current residential patterns.

o The Preferred Alternative will benefit future water-related uses in the Fort Point Channel, notwithstanding its aesthetic impacts. See Section 4.14.2 <u>Effects on Historic Properties</u> for a description of mitigating measures in Fort Point Channel required under the Section 106 <u>Memorandum of Agreement</u>. Alternatives 2, 3, 3A, 4, 5 and 6 would have serious negative aesthetic impacts on Fort Point Channel which would discourage future water-related land uses; Alternative 3A would have additional negative land use impacts because it requires taking the U.S. Customs Building; Alternative 3 would have long-term negative impacts on the Rowes/Fosters Wharf parcel. Alternative 5A would have less significant aesthetic impacts on the northern portion of Fort Point Channel than the other build alternatives. The No-Build Alternative does not affect land use in Fort Point Channel.

o The Preferred Alternative will cause significant construction period land use impacts at Logan Airport. Alternatives 2, 3, 3A, 4, 5 and 5A would cause less significant constrution period impacts on Logan Airport. The No-Build Alternative and Alterna-

tive 6 would not have direct impacts on Logan Airport.

4.4.2 No-Build Alternative

Long-Term Impacts

The Region

Vehicular access to the Boston Central Business District and Logan Airport is presently difficult at times. This condition will be exacerbated with the No-Build Alternative as traffic volumes and congestion increases on both the Central Artery and the cross-harbor facilities. This traffic congestion may marginally reduce development potential in some areas as compared to the Preferred Alternative, but is not expected to significantly change existing regional land use patterns.

In the Central Artery corridor, office development will continue, but the elevated Central Artery will continue to dampen change and impede development of land uses compatible with those of adjacent districts because of degraded access, the poor pedestrian environment, obstructed views, and noise and vibration from traffic on the Central Artery. Rehabilitation of historic structures in the Broad Street area will continue, although perhaps at a slower pace and with lower market rents than would occur with the Preferred Alternative.

South End

Development potential in the institutional/industrial area along Albany Street will be less with the No-Build Alternative than with the Preferred Alternative, because access to the Airport will not be improved. Property values in the area are expected to increase gradually.

Industrial Triangle

There will be no long-term land use impacts from the No-Build Alternative in this area.

South Boston

With the No-Build Alternative, development of the northern, industrial, portion of South Boston will continue, but at a lesser pace than with the Preferred Alternative.

Fort Point Channel

Growth in development potential will continue but will be less than with the Preferred Alternative because regional access is not improved. There are no impacts on individual parcels with the No-Build Alternative.

Leather District

Development potential in this district may be slightly less than with the Preferred Alternative, which improves access. Continued gradual conversion of buildings to office and residential uses is expected.

Chinatown/South Cove

Through traffic on Kneeland and Beach Streets will continue to hinder circulation within this district to the detriment of local land uses. Some institutional and residential redevelopment is likely to occur.

Financial District

No significant changes in this district are expected with the No-Build Alternative; however, the Central Artery will continue to have some negative impact on land uses which lie adjacent to the elevated structure. Continued development and relatively slower increases in property values

xpected.

Waterfront

There are no significant ts on land uses expected in this ict with the No-Build Alterna- Redevelopment of this area is y complete.

Government Center

There are no impacts on this with the No-Build Alternative.

North End

Due to increases in noise and pollution, growing cross-harbor fic will have increasingly adverse cts on residences and businesses oss and Hanover Streets and the surrounding the tunnel portals. dential property values, however, expected to continue to increase.

North Station

The No-Build Alternative will cause land use changes in this , although it may dampen the bilitation of the Bulfinch Tri- e.

West End

The No-Build Alternative will no impacts on land use in this .

East Boston

Increases in cross-harbor fic will also increase traffic on streets serving the existing els. Land use conflicts will inue on portions of Bremen and ans Streets, where residential and port-related land uses are located lose proximity. Demographic ges, including an increased average age of the resident population, may increase the seriousness of these problems in these localized areas; the No-Build Alternative will exacerbate such problems near the existing tunnels.

Logan Airport

Growth in passenger and air cargo volumes will occur independent of any roadway improvements, and congestion on Airport roadways will increase, probably causing some spillover of Airport activities into the East Boston community unless changes are strictly controlled by City policy.

Route 1A North

The commercial development potential of land with highway frontage will increase less with the No-Build than with the Preferred Alternative. Some airport-related and other commercial and industrial development is possible on vacant sites.

Charlestown

The redecking of the Central Artery will not have any land use impacts on Charlestown.

Construction Impacts

For the region as a whole, the South End, Industrial Triangle, Leather District, Chinatown/South Cove, South Boston, Fort Point Channel, East Boston, Logan Airport, and Route 1A North areas, there will be no direct construction period impacts. Some significant delays may be experienced on roadways in these areas as a result of traffic bypassing the increased congestion on the Central Artery during redecking, although this traffic is not expected to affect

existing or proposed land uses.

The Financial District, Waterfront, North End, Government Center and North Station areas will experience noise, dust and traffic congestion impacts as a result of construction. The redecking procedure will remove one traffic lane from operation at a time, and will close portions of the area beneath the Artery for exclusive use by construction equipment. In part or whole, existing parking areas, pushcart storage, pedestrian crossings and surface roadways beneath the elevated Central Artery will be displaced or inconvenienced for a period of approximately three years.

While access will be maintained at all cross streets, activities in the North End, Blackstone Block, Government Center, Financial District, North Station and Waterfront areas will be severely inconvenienced. These disruptions are not expected to change existing or proposed land use patterns. They may, however, alter the pace and timing of public and private investment in these districts.

4.4.3 Preferred Alternative

The Region

Long-term impacts of the Preferred Alternative on the region will be most noticeable in those areas where traffic service has been most seriously affected by delays on the Central Artery, and has inhibited development which might otherwise have occurred. Suburbs close to Boston, including Quincy, Milton, Chelsea, Somerville and Revere, may experience some increase in development due to improved access to and through Boston. These communities may become more attractive locations for industries which depend on access to Logan Airport and for service industries which require fast access to downtown Boston (e.g., printing, office supply wholesalers, data processing). The high-tech industries located along Route 128 (Interstate Route 95) and Interstate Route 495 will also benefit from improved access to Logan Airport.

Large shifts in residential preferences are not likely to occur as a result of the project. Improved access to and through Boston may marginally affect the fluidity of the housing market in the Boston metropolitan area. In particular, easier access between northern and southern suburbs and downtown may influence household locational decisions by giving individual households greater choice in choosing where to live, as a result of making access to work a lesser constraint.

The depression of the Central Artery will create approximately 20 acres of developable land in downtown Boston. Based on urban design studies and structural considerations, it is estimated that this land could accommodate approximately 2.75 million square feet of development (excluding parking and open space). It is expected that the new parcels will be developed for uses similar to those in abutting districts. This will have the effect of reconnecting these parts of the City which were separated as a result of the construction of the elevated Central Artery. The pace at which the land is made available will be controlled by the Commonwealth, in coordination with the City of Boston, in order to prevent negative impacts on other development proposals.

Secondary impacts of this potential development are addressed throughout this document. Traffic

generation from use of these parcels is included in the 2010 traffic forecasts as part of anticipated growth; economic impacts are addressed in Section 4.6; aesthetic effects are discussed in Section 4.16; and secondary joint development effects are discussed in Section 4.4.4.

The disposition of new parcels will be carefully regulated. Disposition will be consistent with the development controls outlined at the end of this section (see Section 4.4.4, Joint Development). Development of these parcels can have positive impacts, both locally and regionally, by ensuring that there is a mix of uses serving a wide range of users, and reflecting the interests of those abutting neighborhoods most directly affected by the project.

Navigation channels in Boston Harbor will not be affected over the long-term by the project.

Construction impacts on the region will occur as a result of traffic congestion and inconvenience in downtown Boston. Impacts on development are not expected to be noticeable at a regional scale.

Navigation in Boston Harbor will be affected during construction. The shipping channel will be closed for one day each time a sunken tube section is put in place. This will occur approximately nine times over a three-year period. At all other times at least one-half of the shipping channel will be open.

South End

Long-term impacts on the South End industrial area will be positive, owing to improved access to the airport for high-tech industries and developments. No long-term land use impacts on the residential portion of the South End are expected as a result of the project.

Construction impacts on the South End will result from increased traffic congestion on Albany Street when the width of ramps to the Southeast Expressway is reduced. The 18-24 month disruption in access will not cause land use changes.

Industrial Triangle

Long-term impacts on land use may be positive owing to improved access to downtown and Logan Airport via the improved Central Artery and the Third Harbor Tunnel. Minor property takings in the area will not cause changes in land use.

Construction impacts will result from congestion on Frontage Road and on the industrial section of Dorchester Avenue. Firms with marginal levels of business could be affected when access is impaired during construction, possibly causing some changes in land use.

South Boston

Long-term impacts on land use will occur in two areas of South Boston: the industrial area north of First Street; and the South Bay area.

The project can be expected to have important beneficial consequences on the timing and amount of development which occurs in the area as a whole. There are also a number of parcels on which the project will have a direct negative physical impact, resulting in changes in possible future use or delays in development (see Table 43 and Figure 34).

Table 43
SOUTH BOSTON LAND USE IMPACTS

PROPERTY OWNER/ CURRENT USE	TAKING	RELOCATION OF BUSINESS	APPROXIMATE AREA AFFECTED	SUMMARY OF IMPACTS
1. Gillette/surface parking, oil tanks	partial	No	13,000 sf open tunnel 19,000 sf over tunnel	Approximately 40 parking spaces permanently taken; no severe impacts on business.
2. Boston Wharf Co./ surface parking, development parcel	partial	No	11,000 sf open tunnel 54,000 sf over tunnel	11,000 sf of open tunnel cannot be used in the future. 54,000 over tunnel can be overbuilt, but will require foundation premiums. The project constrains use of large parcel.
3. Solomon/surface parking	full	yes, see Relocation Impacts, Section 4.3	39,000 sf	Will be taken in entirety. Permanent easement for tunnel constrains use of parcel for buildings and would require foundation premiums. Parking use can occur following construction.
4. Slade Gorton fish distributor	full	yes, see Relocation Impacts, Section 4.3	27,600 sf	Permanent taking; ramp and tunnel easement severely constrain future use of existing parcel.
5. Boston Plate & Window Glass/ manufacturing, warehousing	full	yes, see Relocation Impacts, Section 4.3	49,700 sf	Subsurface tunnel easement constrains future use; surface parking could occur.
6. Post Office/ surface parking, vehicle maintenance	partial	no	290,000 sf total affected, 145,000 sf available post-construction	Permanent parking loss of approximately 340 parking spaces. A major parcel is permanently lost from other than highway use and the site is severed by ramp. Parking can be replaced on other adjoining parcels following construction.
7. McCourt/surface parking	full	no	70,000 sf; 24,000 sf over tunnel or surface road	Parcel is reduced in size by 30% by roadway elements; access to the site from Congress Street is cut off, greatly reducing its value for future development, approx. 85 parking spaces lost during construction.
8. Conrail one live rail line, abandoned lines, vacant	partial	no	21,000 sf	The parcel will be permanently encumbered by a ramp and subsurface easements; use for rail line can continue at all times with permanent rail easement granted.
9. Contos property/ vacant	temporary, partial	no	50,000 sf (3,000 sf over tunnel)	Approximately 3,000 sf of the parcel will be permanently encumbered by subsurface easement. This will not affect long-term use of the parcel.
10. Former Penn Central land/vacant	partial	no	69,600 sf (surface road)	The taking will create a new surface street providing access to the tunnel; current plans for the land are for long-range office development; the project will have a positive impact in the long term.
11. Noymer, Inc.	full	yes, see Section 4.3	87,000 sf	A major part of the site will be permanently encumbered by tunnel elements.
12. Harding Co./ manufacturing	full	yes, see Section 4.3	42,000	The industrial user be displaced. Following construction, a significant portion of the parcel will be constrained by a subsurface easement.
13. Commonwealth Flats/ mixed use, vacant	partial	yes, see Section 4.3		Commonwealth Flats as a whole will have its flexibility reduced because no access across the parcel from Northern Ave.to Summer St. Specific parcel impacts are shown below.
A. Option Parcel I	no	no		Not affected
B. Option Parcel II	no	no		Not affected
C. Fish industries and restaurants	no	no		Not affected
D. Surface parking area	no	no		Minor taking by ramp. [illegible] parking.
E. Turner Fisheries	partial	no, mitigating measures required	20,000 sf taken	Loading dock and interior of building to be reconfigured to allow business to operate.
F. Pappas Building	full	yes, see Section 4.3	196,000 sf permanently encumbered	Building is taken and site significantly [illegible] by surface and subsurface project elements. [illegible]mum parcel depth between Summer Street and [illegible] is 110 feet. (Total parcel is now [illegible] sf.
G. Vacant area	partial	no	195,000 sf permanently encumbered	Potential use for storage and washing of [illegible] cars, of existing 360,000 sf, more than half [illegible] permanently encumbered, this includes a [illegible] of 60,000 sf which will be landlocked by [illegible] and by parcels owned by others.
H. Commercial Union Insurance Company	full	yes, see Section 4.3	200,000 sf	The land to be taken will be permanently [illegible] the project and will not be available for [illegible] other uses following construction.
14. Caribou Fisheries	temporary, partial	no	10,000 sf	Temporary taking to construct the tunnel, [illegible] returned current use after construction.
15. BMIP				
A. Surface parking	temporary	no	35,000 sf	Temporary taking, following construction [illegible] returned to existing use.
B. General Ship staging area	partial	no	35,000 sf temporary, 4,800 sf permanent	Temporary taking can be returned to current [illegible] following construction, 4,800 sf permanently taken for ventilation building.

Figure 34
Land Use Impacts
South Boston

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Legend

Tunnel or New Roadway

Boundary of Affected Parcel Identified in Table 43

The development proposals which currently exist for northern South Boston fall into two broad categories: industrial development, and residential/commercial development oriented to downtown. In general, the industrial parcels are located in the eastern portion of the area, and the commercial or residential parcels are located closer to Fort Point Channel.

The project will generally increase the value of land and may cause development of offices, hotels and condominiums to occur sooner than would happen without the project. The parcels near Fort Point Channel will benefit from improved regional vehicular accessibility, particularly from the expressway connections to the south and west, allowing less reliance on connections made via the Northern Avenue Bridge and Dewey Square. Land use will also benefit from improved pedestrian access via a new walkway on the western edge of the Channel.

Continuing consideration of joint development opportunities suggests possible design modifications to the ramp connections to Northern Avenue that could improve transportation performance and development possibilities for adjacent properties. These modifications could include paired one-way streets on either side of a portion of the former Penn Central property.

In the industrial areas, the project will be of particular value to industries such as electronics and bio-medical enterprises which will benefit from improved Airport and regional highway access. Planned development of Bird Island Flats at Logan Airport and BOSCOM in South Boston is aimed directly at this market, and both of these developments will begin operating in 1984. The project may have significant positive impacts on BOSCOM by putting it within a few minutes drive of Logan Airport and Bird Island Flats, thus increasing the opportunities for "high tech" industrial development in this portion of South Boston. Improved access to the regional highway system may also enhance the development of contain port activities in South Boston.

Industrial land uses will b strengthened by improved access to Castle Island, White Fuel and othe industries located on East First Street. Through trucks will be reduced on local South Boston stre a significant benefit to residenti land use.

Massport-owned Commonwealth Flats is a significant area of pla development. Construction of the tunnel will require the re-parceli tion of this area, and will result the removal of approximately 14 ac from future development use. Seve large tenants will be displaced by project (see Section 4.3), includi the Pappas Building (167 employees and the Commercial Union Insurance Company (67 employees).

The northern half of Commonwealth Flats is currently planned accommodate buildings and parking related to the BOSCOM development, cruise ship terminal and the Fish Pier. The southeastern portion of site, with access via the Massport Haul Road, is scheduled to be used storage parking and washing of imported cars. The project does not intrinsically interfere with these planned uses; however, site circul tion will require adjustments, and total quantity of land taken for t project may require the constructi of a parking garage to provide an adequate number of parking spaces Commonwealth Flats. Parcel depth sufficient from both Summer Street Northern Avenue to accommodate dev opment, but service access may be difficult to achieve. Any changes specific parcel configuration will addressed in the preliminary desig phases of the project.

There will be a permanent l of 340 parking spaces at the U.S. Office parking and vehicle mainten facility in South Boston (see Miti ing Measures below). The primary access point to the facility will to be relocated. The Post Office

ans to construct an operations/maintenance building on its South Boston operty. The project will not eclude construction of this Post fice facility, but coordination of e siting and design of the new ilding with the project is necessary.

In the South Bay area, the oject will result in the creation of small development parcel abutting e Gillette Company headquarters. cess to the Tolman Manufacturing mpany will be shifted from Dorester Avenue to Foundry Street, though land use does not change.

The project will not cause land se impacts which affect the long-term ctivities of the Gillette Company.

At the present time, Dorchester venue is closed to the public and ere is no pedestrian access between e Broadway Station area and South ation. Access between these areas ill be significantly improved with e provision of a new northbound orchester Avenue and a pedestrian alkway connecting to Summer and ongress Streets.

The project will not have ong-term land use impacts on South oston's residential area.

Construction impacts will nclude congestion caused by increased raffic, both in the northern industrial area and in the southern resiential area. In the northern area, he temporary narrowing of the Summer treet and Congress Street Bridges, nd construction on Northern Avenue nd Summer Street will cause congesion and impair access. This could emporarily slow development during he four year construction period in his area.

The West Fourth Street Bridge ill be rebuilt as a separate project rior to the construction of the Preferred Alternative; the new Herald Street Extension will be built as part of this project while the existing Broadway Bridge is open. Therefore, access to the southern half of South Boston will not be seriously affected by construction.

For approximately one year, construction activities would preclude General Ship, Inc., located at BMIP, from using several of its facilities, including Pier 5, the facility's steam plant, and parking areas. (Building 53, which the company has been using for material assembly operations, is expected to be given up by General Ship and leased to another entity for activites that would not require access to Pier 5. This new company(ies) will also suffer due to the loss of parking areas, and will therefore require replacement of this parking area.)

Viaduct Street, between Summer and Ramp Streets, will be closed for approximately 18 months. This will inconvenience BOSCOM and will require special provisions for a ground-level pedestrian entry from Northern Avenue.

The project will require the temporary taking of approximately half of a BMIP owned, 250-car parking lot for 12-18 months. BMIP tenants of Buildings 19, 32 and 17 will be affected by construction noise and dust; however, access to these buildings from Northern Avenue will be maintained at all times, and no disruptions in business activities will be caused.

Construction period loss of 460 parking spaces (in addition to the 340 spaces permanently lost) at the U.S. Post Office South Boston facility will occur. Construction period displacement of approximately 220 spaces on the Boston Wharf site, and 130 spaces at the Solomon surface parking lot, will also occur. During construction, approximately 125 spaces will be temporarily displaced at the Gillette Company.

Mitigating measures will be implemented to ensure the availability of facilities for the continued operation of General Ship, Inc. during the construction period. At BMIP this would require the construction of a

temporary parking lot, relocation of steam lines, and the temporary relocation of drydock operations to the BMIP's large drydock number 3 (Pier 6, an alternative to Pier 5 considered earlier, will largely be used under an easement agreement by General Ship's neighbor, Pier 7 Corp., for expansion of its commercial fishing operation.) During preliminary design, alternatives to accomplish this will be explored.

Access along Northern Avenue will be maintained at all times to ensure access to all facilities at BMIP. Temporary parking may be provided on sites such as the western portion of the container shipping area which Massport plans to construct (if it is not in use for containerport activities).

Construction staging areas located on Commonwealth Flats will be provided away from areas used by BOSCOM and Fish Pier for surface parking to minimize disruption of their activities. The Turner Fisheries (located at Commonwealth Flats) loading dock will be moved, and their internal space reconfigured to ensure their continued operations during and after construction. These adjustments to the operations of Turner Fisheries may not conform to the plans which Massport has made for this area, which call for servicing to occur from the rear yards of structures rather than front or side yards; project design refinements will address the need to achieve consistency with land use plans for the area.

Construction period parking replacement for the Post Office will be provided through such mechanisms as short-term use of designated parking spaces in the South Station Transportation Center garage. In the long-term, Post Office parking will be replaced on sites near the existing parking area. It is expected that the private sector market for commuter parking will spur earlier development of other proposed parking structures in South Boston, which will accommodate any displacement of privately-owned, publicly available parking areas in South Boston.

The pedestrian connection between the Broadway Station area a South Station will be as direct as possible, and must be carefully integrated into the development of new parcel between the present and proposed locations of Dorchester Avenue. This may require maintenan of a public pedestrian easement acr the parcel that is created between existing Dorchester Avenue and new Dorchester Avenue, or other suitab solutions.

Mitigating measures for the museums during the construction per will include special signing and ar information program informing patr that access across the Congress St Bridge will be maintained at all times. Parking for tour buses wil provided near the museums.

Fort Point Channel

Long-term impacts on the Fo Point Channel area will be general positive, as access to the area is improved for both vehicles and pede trians. Motorists coming into Bost from the south along Dorchester Av will have views of Fort Point Channel. This increased visibility ma enhance the area's attractiveness development. The surface area of Fort Point Channel will be slightl reduced south of Congress Street w construction of the Preferred Alternative.

The provision of vehicular a pedestrian access across the Centr Artery via Pearl and Oliver Streets will reinforce the connection betw the Fort Point Channel area and downtown. Pedestrian access to th water's edge (along the outer edge the tunnel box) will enhance the development potential of water-rel uses such as marinas and outdoor restaurants. The creation of a pedestrian route between South Bost and downtown will increase foot traffic in the area, and may also contribute to a gradual increase in

ter-related commercial uses. New rchester Avenue and the pedestrian ute along the Channel will not nterfere with the operations of the st Office.

The project is consistent with A land use plans for the area, and ll add a portion of the continuous aterfront walk planned by the city. e navigability of Fort Point Channel ill not be affected by the project. he site of Rowes/Fosters Wharf will ot be affected by the project, lthough if construction is underway uring the leasing period, some delays n full occupancy may occur due to onstruction noise and traffic.

Long-term use of several arcels will be affected by the roject. The Boston Edison parcel ill be permanently constrained by a ubsurface Central Artery tunnel asement. This parcel is already onstrained by utility substation omponents, including prior power lant foundations. The further estriction on possible locations for oundation piles will add to the ifficulty of developing this site.

The Hook Lobster Company will e taken for construction of the unnel. The use of the parcel following construction has not yet been etermined; one possibility is the reation of a park to be linked to the istoric Northern Avenue Bridge (see Section 4.4.4 <u>Joint Development</u>).

A new parcel, suitable for use as a public boat landing and park, will be created at the end of Fort Point Channel (just west of the existing Dorchester Avenue Bridge). See Section 4.4.4 <u>Joint Development</u> for a description of this parcel.

<u>Construction impacts</u> on the Fort Point Channel area involve temporary disruption caused by barges in the Channel and construction equipment along Summer Street, Congress Street, and Northern Avenue; and congestion on these streets and Atlantic Avenue due to temporary Fort Point Channel bridge narrowings and Central Artery construction. This may temporarily dampen the area's marketability for office space during the construction period and cause business losses to small commercial establishments.

For approximately four years, 100 parking spaces on the Boston Edison parcel will be lost. All 54 parking spaces adjacent to Russia Wharf will also be lost during the second and third years of construction.

Impacts caused by loss of parking spaces will be offset in part by the addition of public parking at the South Station Transportation Center, due to be available in 1989, and at Rowes/Fosters Wharf expected to be completed in 1987.

<u>Mitigating measures</u> include traffic control measures which address the concerns of Stone & Webster and of the Post Office, to ensure that there is no disruption in access and that delays to Post Office trucks using Summer Street or Dorchester Avenue are minimized. Specific traffic management measures will be formulated following consultation with the Post Office operations staff during preliminary design.

Coordination with plans for the South Station Transportation Center will occur in order to minimize any impacts on leasing or continued development of the Center.

Pedestrian and vehicular access across the Channel at Summer Street, Congress Street and Northern Avenue will be provided at all times.

<u>Leather District</u>

<u>Long-term impacts</u> to office and residential development are expected to be beneficial owing to projected decreases of through traffic in the district and improved access to downtown and the region.

<u>Construction impacts</u> on land use in the Leather District will consist of construction traffic and

disruption, possibly causing delays in development or reuse activities. Actual construction in the district will be minimal.

Mitigating measures include traffic management and construction staging techniques to minimize traffic disruption during the construction period.

Chinatown/South Cove

Long-term impacts will be beneficial as a result of decreased traffic on Kneeland Street and Beach Street. Decreased traffic will reduce barriers between related uses.

Construction impacts in this area will be caused by increased traffic on Kneeland Street during the construction period; this may affect restaurant and tourist trade activity in the area, but will not cause changes in land use.

Mitigating measures will include traffic management techniques to minimize disruption during the construction period. Particular attention will be paid to preventing the use of Beach Street as a detour route.

Financial District

Long-term impacts will not cause significant changes in land use in the Financial District. High-intensity office uses will continue to predominate in the Federal/Franklin Street area. Improved access to Logan Airport will be advantageous for existing and proposed developments. Access from the Central Artery to the Financial District will change as a result of relocating entrances and exits to the Central Artery, and changes in the surface street pattern. This will re-route some traffic and result in some shifts in ground floor uses as the circulation paths of pedestrians shift to adapt to the new traffic pattern.

The removal of the elevated Central Artery will have impacts on land use along the edges of the Financial District (see Section 4.4 Joint Development). The physical barrier between the Financial District and the Waterfront will be removed. This will allow visual and functional connections between the two areas, consistent with City plans. Property values are expected to rise, possibly causing the displacement of marginal businesses and the redevelopment of parcels near the Central Artery for higher intensity uses. These parcels and those created by the depression of the Central Artery, could house a variety of uses including office, retail, residential and open space. The re-establishment of the city street pattern which existed prior to the construction of the Central Artery, and the development of the parcels, will strengthen the Financial District, and perhaps increase its diversity of uses.

The project may increase development pressure for Class A office space in the Broad Street area. Major redevelopment has not occurred in this area, in part due to the presence of the Central Artery. The physical characteristics of the buildings in this Historic District are protected by local, state and federal statutes and regulations. Change may come in the form of pressure for rehabilitation for luxury office reuse. It is probable that some form of rehabilitation and reuse may occur over the next ten years even if the project is not undertaken.

Approximately 70 parking spaces will be lost due to the taking of the publicly-owned parking lot at Purchase Street/High Street/Atlantic Avenue. This may encourage the use of vacant parcels for surface parking or add further pressure on development of parking structures across Fort Point Channel. These displaced spaces will be replaced by the project. Sixty metered on-street spaces will be permanently taken by the project in the first year of construction. On-street angle parking along existing Dorchester Avenue between Summner and Congress Streets will be removed;

rallel parking will be provided in is area.

Construction impacts will clude increased traffic congestion d inconvenience due to street .osings and re-routings. Construc- .on activities in this area will have egative effects on air quality and oise levels. These may retard office evelopment in the Broad Street area, d may slow the absorption rate for e new office space due to enter the arket during the construction per- od. Traffic congestion will be most isruptive to the area's few truck- ng-dependent businesses, most of hich are in the Broad Street area or ear the Central Artery.

Mitigating measures include rovision of improved traffic con- rols, signing, media releases, and areful establishment of detour routes uring construction.

aterfront

Long-term impacts will be ositive, and will result from the development of newly created parcels n air-rights over the depressed Central Artery. Land use on these parcels will be consistent with existing uses in the Waterfront area. Removal of the Central Artery will visually reconnect the Faneuil Hall Marketplace area with the rest of the Waterfront and the North End. The "Walk-to-the-Sea" will be established as a major component of the improved pedestrian environment. The setting of BRA Parcel D-10 and Rowes/Fosters Wharf will be enhanced by the proj- ect. New development parcels over the depressed Central Artery will be appropriate for buildings with com- mercial uses and parking on the lower floors, and office or residential uses on upper floors, similar to other buildings in the area, or for open space. Decreased traffic along North Street will improve the environment around the Bostonian Hotel and the rest of the historic Blackstone Block (see Section 4.4.4 Joint Development).

The Haymarket shopping area on Blackstone Street will be affected by the project. Pushcart storage areas (approximately 7,500 square feet of space) crucial to its operation are located under the existing Central Artery, and will be taken when con- struction commences; the storage areas will be replaced at the beginning of the project, before the area under the viaduct is occupied by construction activites. In addition, 12 to 18 produce and fish trucks park under the Central Artery on Fridays and Satur- days when Haymarket is open. The project will result in an increase in usable land area, some of which can be used to replace these facilities. Replacement for this publicly-owned storage space will be provided at the beginning of the project.

Construction impacts will be significant. Construction period dust, noise, and traffic congestion will reduce the quality of the pedes- trian environment for tourists and shoppers coming into the area. Measures will be taken to ensure pedestrian access at all times. Waterfront businesses are very depend- ent upon tourists and other pedestrian customers. Business may suffer at area restaurants and stores, as a result of actual and perceived parking and access difficulties. As discussed below under Mitigating Measures, the Commonwealth is committed to replacing all public and private parking taken by the project in this area, both during and after construction. The Commonwealth will also provide market- ing assistance to maintain business activities during construction.

The settings of the Bostonian and Marriott Long Wharf Hotels will temporarily become less attractive. The "Walk-to-the-Sea" will remain open during construction, but will be affected by dust and noise where it crosses the construction zone.

Business at Haymarket will be negatively affected for approximately three years as construction activities occur adjacent to the outdoor vending area. Measures to mitigate noise and dust will be undertaken to ensure

continued operation of the open air market. During the remainder of the construction period (nine years in this area), activities will be made somewhat more difficult at Haymarket than they are under existing conditions, and mitigating measures will continue to be provided.

Mitigating measures include the maintenance of pedestrian access across the corridor at all times.

To mitigate impacts on Haymarket, pushcart storage and truck space will be provided in the immediate area, both during and after construction. Areas near the construction corridor, such as BRA Parcel 7 (see further discussion below in the Government Center section) or the area adjacent to Waterfront Park, may be designated for these purposes in whole or in part.

Parking will be provided to replace those spaces lost during construction. Possible locations for parking are described below in the mitigating measures discussion for the North End. Parking for tour buses will be provided during construction.

During construction, measures which meet City of Boston Air Pollution Control District regulations to reduce noise and dust will be specified in agreements with contractors (see Section 4.7, Air Quality for a discussion of air quality mitigating measures).

Government Center

Long-term impacts on land use in the Government Center area will not be significant. Vehicular circulation around the area will be permanently changed. In the summer of 1983 a developer was designated for a hotel/commercial development on BRA Parcel 7. The Preferred Alternative may cause impacts on either the design of the development or its implementation schedule due to use of the site by the project for mitigating measures relative to Haymarket operations or for construction staging. One planned ground-floor use of the Parcel 7 site is an expansion area for Haymarket; this could possibly provide a significant amount of replacement space during the construction period.

Construction impacts will result from traffic diverting onto side streets to avoid construction areas and from the loss of parking both under the elevated Central Artery and along the Surface Artery.

Development of two floors of office space above the Government Center Garage may be altered (following consultation with the new owner) if there are construction period requirements for state use of the garage.

Mitigating measures include traffic management, and noise and dust controls. Careful construction staging will be required to minimize the disruption to both Haymarket and the planned development of Parcel 7. This will be given detailed attention during the preliminary design phase. Pedestrian access between Haymarket Station and surrounding areas will be maintained at all times.

North End

Long-term impacts on the North End cannot be determined with certainty, in part because the future of the North End without the project is also uncertain. For the past 20 years, the North End has experienced severe strains because of increases in real estate values, leading to sharp rent increases and widespread condominium conversions. Over the next decade, unless active public policy intervention is undertaken, these changes can be expected to continue and accelerate. The placement of the Central Artery underground could result in two very different impacts. First, removal of the elevated Central Artery could spur a further rise in housing costs and conversions to condominiums in the community. Second, improving the environmental quality of the area could encourage existing residents to stay, help to

strengthen the neighborhood economy, ad, therefore, reinforce the existing community. Both of these possibilities ae described in Section 4.5 COMMUNITY FCILITIES AND NEIGHBORHOOD CHARACTER-ITICS.

Long-term land use changes will ccur on the newly created air-rights rcels and near the entrance and exit eas to the existing tunnels. The wly created parcels and continuous reet frontage will accommodate the velopment of land uses compatible th existing North End uses. The ecific type and size of development ll be determined during the prelim-iary design phase.

Construction impacts will iclude disruption to local commercial id residential land uses due to onstruction-related dust, noise, ibration and traffic, and will ierefore require mitigating measures ich as dust control, muffling of oisy machinery, slurry wall construc-ion to reduce noise and vibration, id traffic management schemes. onstruction period traffic pattern ianges will make both pedestrian and ehicular access more difficult than t is under existing conditions. onstruction disruption, particularly n Cross Street, may discourage people rom coming into the North End and may ake it more difficult for North End esidents to get to the Haymarket MBTA tation. Traffic management will be esigned to mitigate these impacts.

The loss of approximately 370 arking spaces under the elevated entral Artery is a significant mpact, but these spaces will be eplaced prior to their loss from onstruction activities.

Mitigating measures in the North End will include state sponsored programs geared to the maintenance of local businesses during the construc-tion period, particularly merchants on Cross and Salem Streets. In the long-term, there can be similar programs to encourage stability.

Vibration and groundwater table levels will be monitored during construction; see Section 4.1 and 4.8, respectively, for a discussion of the measures to mitigate impacts. Section 4.1 also includes a discussion on how rodents will be controlled during construction.

In order to minimize impacts on residential land uses, construction period noise will be controlled by a variety of measures including contrac-tual limitations on the hours of noisy work permitted, adherence to City of Boston noise regulations, construction of temporary noise barriers, use of mufflers on noisy equipment and use of construction methods (such as slurry wall construction) that are the least noisy possible (see Section 4.8). The Commonwealth is examining a possible program to provide soundproofing (double glazed windows and air condi-tioning) for adversely affected private properties. (The program would be similar to one being current-ly undertaken by Massport in East Boston.)

Provisions to assure pedestrian access to and from the area will be carried out. Traffic controls will be instituted to minimize the diversion of traffic to North End streets; programs will be developed to control construction vehicles and prohibit their use of local, residential streets wherever possible. Heavy construction vehicles will be re-stricted to the project haul road which will run from High Street to Causeway Street.

The Commonwealth is committed to ensuring the availability of parking for North End residents and visitors. Permanent parking facili-ties may also be developed on the air-rights above the depressed Artery. During the construction period, all spaces displaced by the project will be replaced prior to their dislocation, at locations such as state-owned property in the vicin-ity of Haverhill Street (above the MBTA Orange and Green Lines) or city-owned property lying between Fulton Street and the approach to the

Callahan Tunnel. If necessary, replacement parking will be located in specially constructed parking structures.

The state is exploring other parking options such as an agreement to allocate space at nearby garages (i.e., Government Center Garage, Quincy Market Garage, Harbor Tower Garage, Hertz Garage) for North End residents and visitors, and providing (via MBTA or a private service) shuttle service between various parking garages and the North End. These possibilities will be pursued during design to guarantee adequate replacement parking for North End residents and businesses.

North End residents will be consulted in the process which will determine the disposition of air-rights parcels (see Section 4.4.4 Joint Development).

The Commonwealth will work with the City of Boston on programs to provide local residents with opportunities to stay in the neighborhood through municipal controls on condominium conversions and through access to new housing on parcels over the depressed Central Artery. The scope of such programs will be determined in consultation with the City of Boston.

North Station

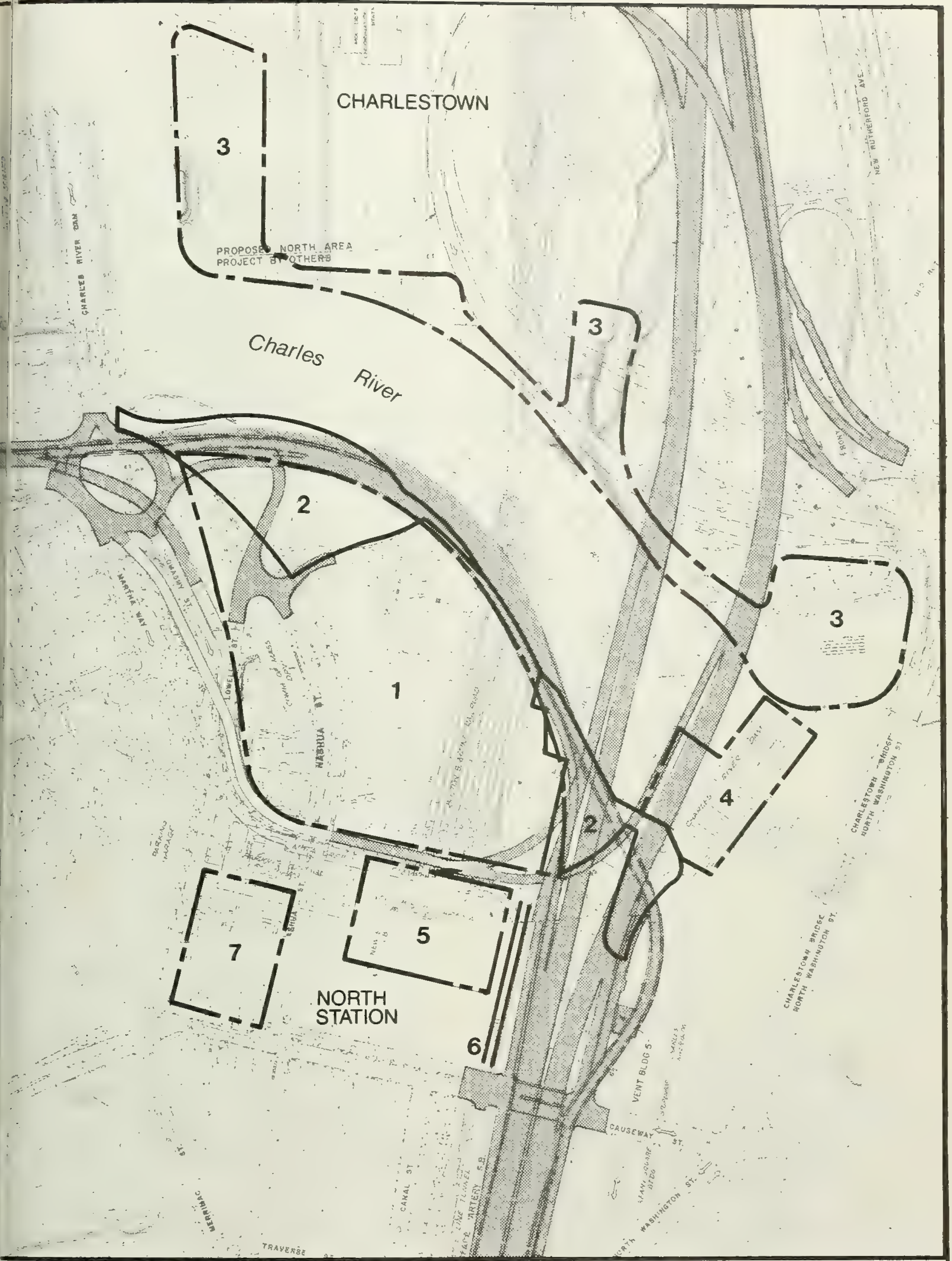
Long-term impacts in the North Station area may result from changes in the local traffic pattern. Access to the area to and from the north will improve due to new ramps at Causeway Street.

Access from the south, however, will become less direct due to the removal of the existing Causeway Street ramps. Traffic coming from the south will exit from the Central Artery to Leverett Circle and travel along Lomasney Way to get to the area.

The project is not consistent with the BRA's initial proposed redevelopment plans for Subarea II of the North Station area or with the MDC's preliminary proposals for a continuation of the MDC riverfront park; see Figure 35 and Table 44. should be noted that these two majo plans are not entirely consistent w h each other, and that reconciliation would be required with or without t construction of the Preferred Alter- tive.

Elements of the BRA's propos plan would have to be redesigned du to tunnel and ramp locations. Acce to potential development parcels wo d be affected by below-grade ramp connections. It is likely that the plans for Subarea II will be reconsidered in the light of changing circumstances in the North Station area. This process would occur in conjunction with preliminary design for the depressed Central Artery.

The MDC plan for the Boston side of this section of the Charles River proposes park use of land now occupied by parking lots for the MD, the Spaulding Rehabilitation Hospit, and the Anelex Building. The propo d MDC greenbelt along the river is currently interrupted by the MBTA's commuter rail tracks entering North Station. The Preferred Alternative will not prevent construction of public open space at the river's ec from the new Charles River Dam to t railroad tracks, but an open, depressed ramp, located approximately 5 feet inland would constrain the wic of such open space. Upstream of th railroad tracks, the private parkin area behind the Spaulding Rehabilit tion Hospital will again be availab for either parking or open space at the river's edge. Further upstream an open depressed ramp rising to surface grade at Leverett Circle wi block access to the river's edge (design refinements currently under y for this area indicate that it may possible to move the ramp inland, t s eliminating this impact). This are is now occupied by MDPW parking and s shown as open space (including an island and lagoon) in the MDC plan. This area will also be crossed by t



Tunnel or New Roadway

Boundary of Affected Parcel
Identified in Table 44

Areas are shown in approximate locations; exact boundaries are not known in all cases.

Figure 35
Land Use Impacts
North Station Area

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Table 44

NORTH STATION AREA LAND USE IMPACTS

	SITE	IMPACT
1.	BRA Subarea II	Elements of the BRA's plan will have be redesigned due to tunnel and ramp locations.
2.	Proposed MDC greenbelt along Charles River, Boston side	Public open space along river edge from Charles River Dam to railroad tracks uninterrupted. An open depressed ramp rising to surface at Leverett Circle will block access to river's edge (design refinements currently underway for this area indicate that it may be possible to move the ramp inland, thus eliminatin this impact). Two low level bridges will have adverse visual, air quality and noise impacts for pedestrians and bicyclists.
3.	Proposed MDC greenbelt along Charles River, Charlestown side	Not adversely affected.
4.	New Charles River Dam	Access will be maintained via new access road, walkway across dam will adversely affected by shadows and noi from low bridge structure.
5.	Proposed new arena/garage	Building site not affected by the project, but service access as propos will require modifications. Could supply replacement parking for that taken for the Central Artery project. If new complex not built, replacement storage space will have to be built t the rear of the existing Boston Garde due to the taking of the Anelex Building.
6.	Proposed Green Line relocation	Not directly affected by project.
7.	General Services Administration Office Building	Not directly affected by project.

located Nashua Street.

MDC open space plans on the ıarlestown side of the river are not ıversely affected by the Preferred .ternative. Impacts to the new ıarles River Dam and the Paul Revere ınding Park are described in Section .1.3 of the SECTION 4(f) EVALUATION.

Access to the new Charles River am will be maintained via a replace-ent road built parallel to existing everly Street. Replacement of the igh-Level Bridge with two, lower-evel bridges will also have adverse isual, air quality, and noise impacts n the environment for pedestrians and icyclists on the downtown Boston side f the Charles River in the vicinity f the new Charles River Dam. Impacts n this MDC property are addressed in he SECTION 4(f) EVALUATION in Chapter .0, and in Section 4.16 AESTHETIC MPACTS. The project will eliminate ublicly-owned parking under the xisting elevated Central Artery, hich could be replaced as part of a ew Garden/Arena parking structure.

Takings which will occur in the rea include the Charles River Build-ing and the Anelex Building (design odification work now underway uggests that a ramp redesign in the rea may obviate the need to take the harles River Building). The Stop & hop Bakery loading area will be aken, which could result in the losing of that facility (see Mitigat-ing Measures below). Stop and Shop has announced that the bakery will be relocated, independent of this project. The building will be available for a number of other possible uses which do not require such extensive loading facilities. Following construction the building will be available for reuse. Specific impacts due to these takings are described in Section 4.3 RELOCATION IMPACTS. The taking of the Anelex Building will require substitute space for Boston Garden storage and other support activities which currently take place within the Anelex Building. Those parking spaces under the Central Artery which are displaced by the project will also be replaced.

The MBTA's proposed Green Line relocation and commuter rail improvements must be coordinated with the Preferred Alternative to assure that the two projects are compatible.

Long-term impacts on land use will include a reduction in the area's private office space which may result in a change in the area's character, although the General Services Administration's Federal Office Building will add considerably to the number of office workers in the area. The Anelex Building, Charles River Building, and Stop & Shop Bakery contain a significant proportion of the area's work force. Removal of the Anelex and Charles River Buildings (see note above) may change the character of long-term redevelopment of the North Station area. Removal of the elevated Central Artery may also provide impetus to upgrade existing structures, many of which are owner-occupied.

Navigability of the Charles River will not be affected by the project.

Construction impacts will result from a general increase in traffic congestion due to a construction staging area at the site of the Anelex Building, construction of the Storrow Drive connector ramps at the river's edge, and construction of the new Causeway Street ramp. The sequential closing and rebuilding of the ten railroad tracks into North Station will also be required. No loss of service will be caused, because temporary tracks will be provided, although minor delays in service are possible. The railroad spur to the Stop & Shop Bakery will also be removed. Access to the existing parking and loading areas behind the Braman Dow and Company building will be disrupted during years 3 and 8 of the construction period due to temporary ramp construction (see Mitigating Measures).

Disruption due to construction

of the Storrow Drive ramp connections will last approximately 12 months. Traffic detours will not use local streets such as Lomasney Way or Martha Way. Construction of the depressed Central Artery will reduce the total number of lanes on Causeway Street by one-half for a six-month period.

During construction, some parking areas will be lost from the lots serving the Spaulding Rehabilitation Hospital, MDPW, and the Massachusetts General Hospital. When construction is complete, the lots can be restored to their original capacity, except for approximately 20 spaces at the MDPW lot.

Mitigating measures relating to BRA and MDC open space proposals on both sides of the Charles River will be developed with participation by these agencies during preliminary and final design to minimize impacts through design refinements. A description of mitigating measures is contained in Chapter 5.0 SECTION 4(f) EVALUATION.

A pedestrian ramp will be provided on the river side of the ramp connecting the Central Artery to Storrow Drive, and suitable remnants of parcels used for project right-of-way in this area will be made available for public use to mitigate impacts on the Charles River Basin.

In order to ensure continued operations at Braman Dow and Company, the Commonwealth is committed to (in order of preference) either reconfiguring the temporary ramp which disrupts access to the property, reconfiguring the building to allow for loading from Medford Street and/or Causeway Street, or providing new warehousing space in another location. Details will be developed with the owner during later design stages.

Temporary parking for the two hospitals may be provided on MDPW lots during the construction period. The planned relocation of the MDPW to the new State Transportation Building has since reduced the number of spaces required by the state in this area.

During preliminary design, studies will be made of Stop & Shop loading requirements to determine whether it is possible to provide replacement space which would allow the bakery to continue operations throughout construction (see note on Stop and Shop relocation under long-term impacts, above).

Replacement space to ensure continued operation of Boston Garden will be provided. Support space for the Garden could be constructed in area north of the present Boston Garden.

West End

The Preferred Alternative wi have no significant impacts on West End land uses.

East Boston

Long-term impacts will be beneficial to the residential area East Boston due to improved neighbo hood quality of life (see Section 4.5). The project may increase the attractiveness of East Boston for residential and related retail deve opment.

In the future, increased traffic to Logan Airport will gener increased demand for Airport parkin this demand will increase somewhat with the Preferred Alternative. Un current EPA regulations, the Airpor may not increase on-Airport parking therefore there may be economic pressures to increase the amount of off-Airport parking. Vacant parcel in East Boston are particularly vulnerable to these pressures, and shifts in land use may occur in the absence of strict land use controls the City. Long-term impacts on Eas Boston land use will depend on the availability of increased on-Airpor parking facilities.

Construction impacts on residential areas will be slight, as al construction is restricted to Airpo

property. Construction equipment will be restricted to the greatest extent possible from local streets, and will operate on state highways.

The second phase of the Bird Island Flats development project (by others) should be completed by the start of tunnel construction in this area; that development has been designed to act as a buffer between the Airport and residential areas, it will also serve as a buffer during construction of the tunnel. All of the businesses that are displaced by the project in East Boston are located on Massport property (with the exception of a taking at Robie Airport Park).

The Third Harbor Tunnel will be completed four years after project commencement in late 1986. Traffic originating from the southwest of Boston will then be able to divert from the Callahan/Sumner Tunnels to the Third Harbor Tunnel, in order to avoid the Central Artery construction. This will reduce traffic on the Airport access road and on local streets. East Boston residents should benefit from improved air quality as well as decreased congestion.

Mitigating measures are being pursued to reduce the potential for Airport spillover to the East Boston community. A program to review the impact of zoning and other land use control mechanisms (including various de facto licensing by Massport of off-Airport industrial uses) will be undertaken immediately by the Commonwealth and Massport as one element of a total program of mitigation to be included as an integral part of the Preferred Alternative. Lifting the EPA ban on increasing on-Airport parking is being pursued by the Commonwealth.

Logan Airport

Long-term impacts to Logan Airport will include benefits to existing land uses, but will not result in shifts in use. Improved access will reduce congestion on Airport roadways and increase convenience for Airport users. Commercial tenants such as the Hilton Hotel and the Massachusetts Technology Center will benefit from improved regional accessibility. Terminal circulation will be affected at Volpe Terminal, where the Airport egress road will be relocated to the east.

Massport will lose approximately 360,000 square feet of leaseable area to new ramps, roadways, and the ventilation building, but will have the option of leasing two new parcels (now occupied by roadways and landscaping) totaling 190,000 square feet; the net change is a loss of approximately 170,000 square feet of leaseable area (see Figure 36 and Table 45 for further information on the parcels which are described below). Massport has reaffirmed its intentions to make specific relocation proposals for on-Airport sites to all affected businesses. If businesses cannot be relocated on-Airport, the Commonwealth will relocate them to appropriately zoned industrial land.

The Third Harbor Tunnel roadway system is consistent with a two-level roadway system, as proposed by Massport, at the Airport. However, the circulation system as proposed will cause two negative traffic circulation impacts which will affect land use at the Airport:

1. The existing direct right turn from the Airport access road to the service road which provides access to the Southwest Service Area and Bird Island Flats will be closed. Access to this area will require exiting from the main roadway and making two left turns on service roads. The reduction in convenience will increase time and energy costs for rental car companies, cargo and freight facilities and the Massachusetts Technology Center.

2. The recently constructed U-turn will be closed; this will increase travel time for those Airport patrons who are travelling between terminals,

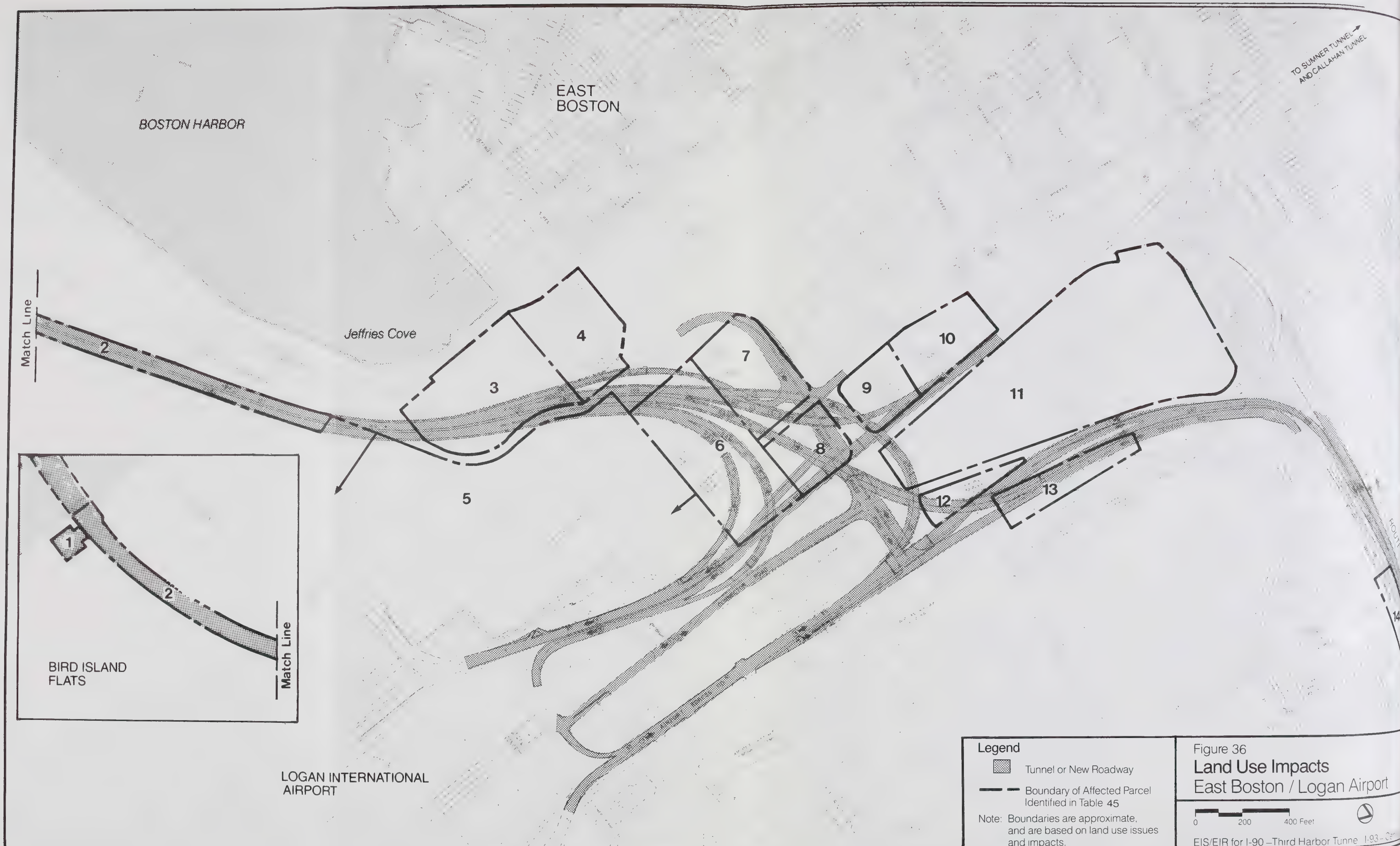


Figure 36
Land Use Impacts
East Boston / Logan Airport

Table 45

LOGAN AIRPORT LAND USE IMPACTS

PROPERTY OWNER/ CURRENT USE	TAKING	BUSINESS RELOCATION	SUMMARY OF IMPACTS
Vacant/future part of IF cargo area	full	no	Ventilation building will permanently occupy the site precluding other uses.
Vacant/future part of IF cargo area	temp.	no	Permanent subsurface easement, will not affect use as a roadway and cargo area.
Eastern Airlines Reservation Center and parking	full	yes	Business will be relocated on adjacent land, subsurface easement will not affect use of area for surface parking.
General Aviation	full	yes	The occupants of this structure were planning to relocate regardless of the project. Future use of the parcel will be constrained in only one small corner by a subsurface tunnel easement.
Eastern Airlines Hangar Jetway	very temp.	no	During approximately 18 months use of the jetway will be constrained, there are no long-term impacts on the parcel.
All Air Cargo and Eastern Air Freight Buildings	full	yes	Buildings will be taken, following construction similar structures could be built over permanent subsurface easements.
National Car Rental	full	yes	Similar use could occur following construction; over permanent subsurface easements.
Vacant parcel			
Hertz Car Rental	partial perm.	partial	Temporary and permanent takings will reduce parcel size. Future use of the remainder of the parcel could remain in its current use.
Avis Car Rental	minor perm.	no	Minor permanent taking, will not affect use of the parcel.

or who missed their destinations.

The National Car Rental facility will be taken, as will the Hertz Express Car facility. A small portion of the Avis Car Rental site will be taken. New parcels will be less suitable for commercial tenants due to their irregular shape.

Vehicular access to the Eastern Airlines hangar and the Massport taxi pool will be altered. The Eastern Airlines fuel farm will be slightly modified, and fuel truck access to this facility will be relocated. Access to the Airport BayBank branch office will be shifted from the egress roadway to a new central service road. Access to the Airport Hilton Hotel will be consolidated at the central service road. Two new parcels now occupied by roadways or landscaping will be created in the central service area, with access from the new service road. The Exxon service station will be removed and relocated to a site on the central service road. Access to the above uses will be somewhat less convenient than at present, but should be adequate for their operations.

Access to the American Airlines air freight building will become more circuitous from the north and require trucks to use the new central service road and to cross outbound terminal traffic. Glycol storage tanks at the American Airlines hangar will be relocated; the landscaped pedestrian entrance to this building will be reduced in size and associated parking will be reduced by approximately 60 spaces. The United Airlines Flight Kitchen and ABC air freight building will be removed; other sites are available at the Airport for relocation of these facilities. Employee parking at the Williams air freight building will be reduced by approximately 45 spaces.

The Eastern Airlines Reservations Center will be taken or underpinned during construction, and adjacent employee parking will be temporarily reduced by 200 spaces. If a taking proves necessary, the bui ing will be reconstructed adjacent its present location and connectio made to existing telephone lines essential for its operation so tha there is no interruption in servic employee parking will be provided.

Parking at the Delta Airlin reservations center will be reduce approximately 55 spaces. The cent building at Robie Airport Park wil shortened by two structural bays, requiring relocation of two tenant an adjacent air freight building w be removed.

The increase in vehicle tri to the Airport may generate additi parking demand at the Airport, whi may require the construction of additional parking facilities. Lifting the current EPA ban on increasing Airport parking is being pursued by the state and Massport an effort to minimize possible spi over effects on the East Boston community.

<u>Construction impacts</u> includ the removal of the Eastern Airline and Hill air freight buildings and Edson general aviation building. Following construction of the proj these sites will be available for similar uses. There is adequate building area at Logan Airport to relocate the occupants of these buildings in a manner consistent w the Logan Airport Master Plan. Th construction of replacement facili will be completed prior to the tak of these structures.

The west satellite on the Eastern Airlines terminal (Southwe Terminal) will not be usable by la turbojet passenger aircraft for a period of approximately 15 months during construction. The adjacent taxiway must be relocated closer t the terminal during the constructi of the tunnel in this tightly constrained area. The satellite term can be used by smaller commuter aircraft during this period with adequate clearance for continued aircraft access to the Eastern Air

nes hangar. The terminal can ntinue to operate normally by means a temporary six-gate satellite rminal (see Mitigating Measures low).

Minor detours of the Bird land Flats access road will be quired during three phases of the ree-to-four year construction period this area. These detours will not gnificantly affect access to Bird land Flats. It appears that it will possible to route the BIF access oad in such a way that it will not ass over the tunnel construction site uring any phase of construction. onstruction of air freight facilities id the Bird Island Flats mixed-use evelopment will be inconvenienced uring the three-year period when a ortion of the freight facilities site s used for construction staging.

Disruptions to traffic on the irport access and egress roads and ne service roadways will occur during ost of the construction period, but ill not significantly affect Airport ervice or operations.

Construction staging areas can e accommodated on sites temporarily aken for construction and on vacant and at Bird Island Flats.

Mitigating Measures include raffic management and measures to educe noise, vibration, and disruption at the Hilton Hotel and at irline terminals near the construction area.

Construction will be staged, and staging areas located, to avoid impacts on the Massachusetts Technology Center development. Construction vehicles will use a separate haul road parallel to the Bird Island Flats access road and will use the Airport service roads connecting to the regional highway system (Route 1A). The majority of excavated material will be removed from the Airport via a service road east of the tunnel alignment.

Additional sites and/or buildings are available at Bird Island Flats, the Southwest Service Area, and the North Service Area to accommodate car rental, air freight, airline reservations, airline kitchen operations, and parking permanently or temporarily displaced by the project (see Section 4.3 RELOCATION IMPACTS). Parking displaced by the project will be replaced at other on-Airport locations with input from Massport on the final locations.

Project construction disruption to Eastern Airlines passenger service, particularly the shuttle service, will be avoided through construction of a temporary six-gate satellite in the center of the Southwest Terminal, facing Bird Island Flats; commuter service which currently uses this apron area will be relocated to the west satellite, as described above.

Modifications to the Airport circulation system will be needed to mitigate less convenient terminal circulation, less direct access to the Southwest Service Area and Bird Island Flats and less convenient access to the North Service Area. A specific design requirement is the replacement of the direct right turn movement to the Southwest Service Area/Bird Island Flats from the Aiport access road. Modifications to the North Service Road near Robie Airport Park may also have the potential to mitigate construction period and long-term impacts to uses relocated to the North Service Area. Any such modifications will be coordinated with Massport during preliminary and final design of the project.

The Airport signage system which provides orientation to airline locations using several large overhead signs on the approach from the Callahan Tunnel will have to be modified for users of the new Third Harbor Tunnel, who will enter the Airport roadway system downstream of these signs.

Route 1A North

Long-term impacts on the area

will be predominantly positive. Some displaced businesses from the Airport may relocate to this area. Increased traffic on Route 1A could be beneficial to businesses which depend on good access and to highway-oriented commercial businesses. Those businesses with time-sensitive deliveries to Logan Airport may have slightly impaired access due to the increased traffic.

Impacts on land use in Revere will be minor, with some increase in business expected because of improved access from Boston.

Construction impacts on land use in this area will be minimal.

Charlestown

Long-term impacts of the project will not cause land use changes in this area.

Construction impacts will not affect land use in Charlestown.

4.4.4 Joint Development

The Preferred Alternative creates a unique opportunity for new development on air rights over the depressed Central Artery (see Figures 37 and 38). The creation of 20 acres of new land for development and the opportunity to rebuild a significant portion of the city severed by the existing Artery are major positive impacts of the transportation project. Realizing the potential benefits of this unprecedented opportunity will require a complex development process involving many public and private interests over a 10 to 15 year period. Possible land uses include recreation, office, retail, residential, parking, and open space. Careful planning will be required to assure that future uses of Artery air rights are viable and compatible with the character of the adjacent neighborhoods. This section describes the steps involved in establishing an effective joint development process and the key issues and constraints to be dealt with in establishing a planning and decision-making mechan

The need to establish a cont uing joint development planning and design process has been emphasized numerous public meetings throughout the EIS/EIR process and in testimon at the public hearings. The Common wealth recognizes the importance of the issue and is committed to an ongoing open participatory process concepts discussed in this section refined and carried through detaile design and execution.

Joint development is discuss in the following order:

1. Design objectives and consid ations including: urban design, structural, historic, and economic issues used in developing an illust tive joint development scheme.

2. Descriptions of specific iss and illustrative design concepts fo individual parcels, grouped by geographical subarea.

3. Description of the proposed joint development process.

Related discussion of develo ment on currently existing parcels adjacent to the project, particular in the North Station area and in Sc Boston, is contained in Section 4.4.3. For assessment of the secon ary impacts of the illustrative development possible within these assumptions, see Sections 4.2 TRANS PORTATION, 4.4 LAND USE IMPACTS, 4. NEIGHBORHOOD AND COMMUNITY FACILITI IMPACTS, 4.6 ECONOMICS, 4.14 HISTOR RESOURCES, and 4.16 AESTHETIC IMPAC

DESIGN OBJECTIVES

This general statement of design objectives for potential development of the 20 acres of air rights is based upon known public policies and on public input from t community participation phase of th project. While specific design guidelines for air-rights developme will be established during the desi phase, these design objectives have

Legend

1. Entry & exit ramps and the transition section from the elevated Central Artery to the Dewey Square tunnel act as a visual and pedestrian barrier between the Financial District and the Waterfront/Fort Point Channel Area.
2. Visual and pedestrian connections between the historic Broad Street District and the Waterfront are complicated by the overhead roadway and its supporting piers and columns. The highway structure is close to the historic brick & granite buildings and conflicts with the scale and character of the district.
3. The Walk-To-The-Sea is affected by the dark environment under the highway structure and by the combined width of the Surface Artery and Atlantic Avenue.
4. The open expanse of surface roadways and the combination of surface, Central Artery, and tunnel connections present a confusing and dangerous situation for pedestrians.
5. The Blackstone block and the Cross St./Hanover St./Salem St. area of the North End share a common street scale, architecture, and pattern of commercial ground floor activities. The artery and its three ramps separate these areas; views across the Artery Corridor are severely limited and pedestrian connections (including the Freedom Trail) are difficult.
6. The width and layout of the surface street system and the isolation of this section under the artery contribute to a hazardous condition for North End residents walking to the Haymarket MBTA station.
7. Street and building pattern of historic Bullfinch Triangle is severed by the artery and ramps.

Pedestrian and Visual Corridor

Visual Corridor

Existing Central Artery and Ramps

Pedestrian Connection Blocked

Figure 37
Existing Context
Central Artery from Congress St. to Causeway St.

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Air-Rights Parcels

Parcel 1	Congress Street – Pearl Street	32,000 S.F.
*Parcel 2	Pearl Street – Oliver Street	62,000 S.F.
*Parcel 3	Oliver Street – High Street	90,000 S.F.
Parcel 4	High Street – India Street	66,000 S.F.
Parcel 5	India Street – Milk Street	36,000 S.F.
Parcel 6	Milk Street – State Street	37,000 S.F.
Parcel 7	State Street – Clinton Street	80,000 S.F.
*Parcel 8	Clinton Street – North Street	48,000 S.F.
*Parcel 9	Fulton Street – North Street	50,000 S.F.
*Parcel 10	North Street – Hanover Street	22,000 S.F.
*Parcel 11	North Street – Hanover Street	90,000 S.F.
*Parcel 12	Hanover Street – Haymarket Square	85,000 S.F.
Parcel 13	Endicott Street – Cooper Street	32,000 S.F.
Parcel 14	Haymarket Square – Traverse Street	35,000 S.F.
Parcel 15	Bounded by North Washington Street, Beverly Street and Traverse Street	12,000 S.F.
Parcel 16	Traverse Street – Causeway Street	65,000 S.F.
	TOTAL	842,000 S.F. (Approximate…)

*Parcel partially encumbered by ramp(s). Air-Rights available for development on 2nd floor level and …

New Air Rights Parcels

Figure 38
Joint Development Opportunities
Preferred Alternative
Central Artery from Congress St
to Causeway st.

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Centr…

used to illustrate joint development potential and are illustrated in Figure 39.

. Street and block patterns should be in scale with that of existing neighborhoods or districts and should re-establish a city circulation system similar to that which predated the construction of the Central Artery.

. Maintain the major existing pedestrian links connecting activity centers across the corridor's surface streets, such as the "Walk-to-the-Sea" and the Haymarket to North End connection.

. Establish parcels of sufficient size, depth, and configuration to permit flexibility in potential development, and to allow for compatible land uses and densities.

. Where necessary within development parcels, development should accommodate or incorporate ramps or ventilation buildings above the depressed Central Artery.

. Design building forms and open spaces to re-establish the visual links between functional areas presently severed by the Artery.

. Develop open spaces to assist in pedestrian orientation. Provide visual and physical settings for important activities and prominent buildings.

. The effort of reconstructing this portion of the city should center on developing each parcel in harmony with its immediate environment; thus, the corridor" effect would disappear.

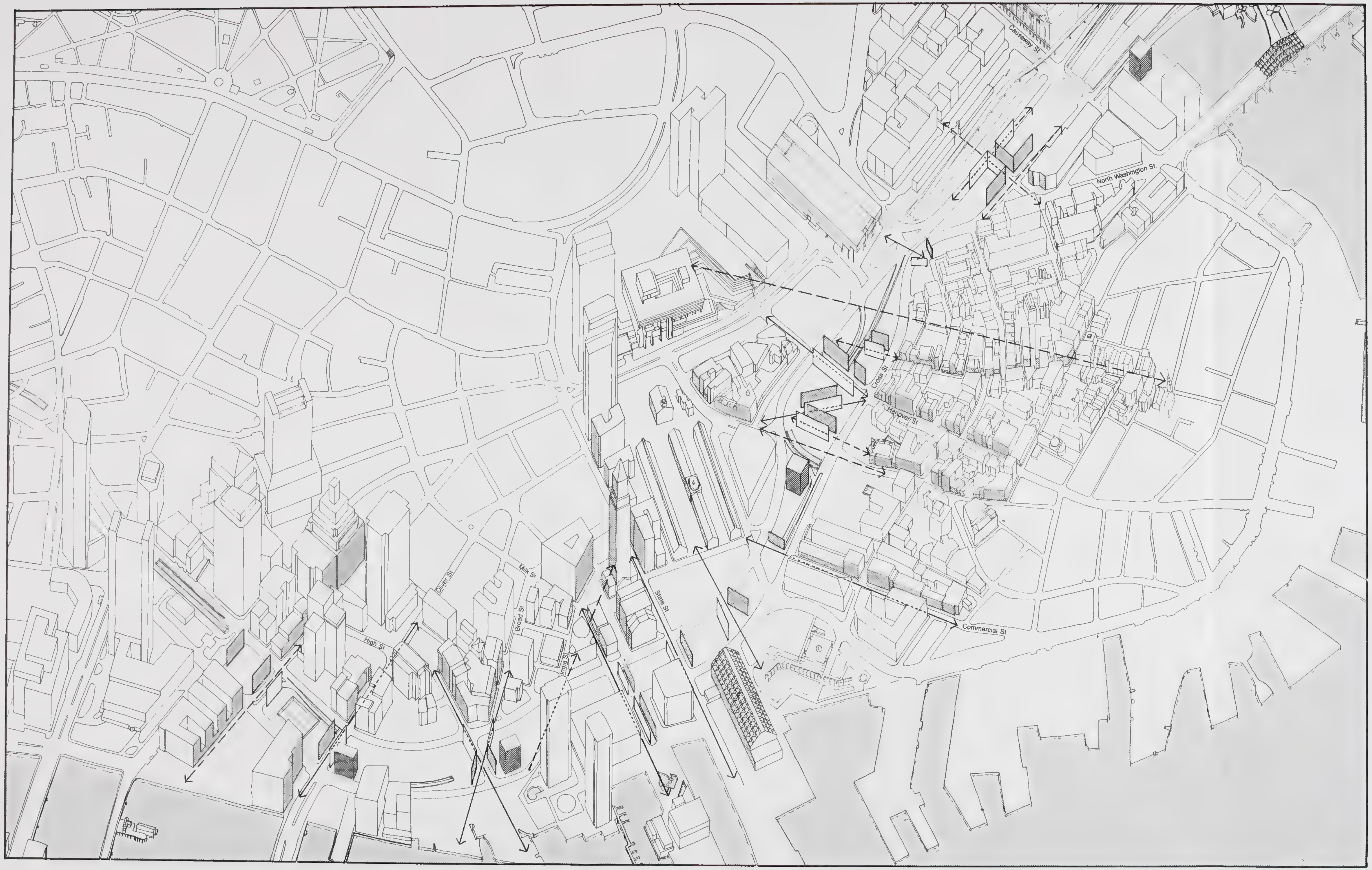
DESIGN CONSIDERATIONS

A number of air rights development issues must be resolved. Developing air rights over the tunnel and ramps will present significant structural design considerations, foundation premiums, and legal and financial risks of long term decisions and investments some 10-15 years prior to the actual construction. Subsidy of certain uses will also have to be considered. While specific uses of most parcels cannot be preestablished, planning and decisions about foundations, access, and to some extent the type and massing/building envelopes of air-rights structures must be worked out during the highway design phase for incorporation in construction.

Final engineering and other design phase decisions may modify specific assumptions. On the basis of current conceptual engineering, at least four kinds of issues must be addressed, as follows:

1. Structural Considerations. Based on the conceptual structural design of the tunnel, air-rights development capability differs significantly from parcel to parcel. Each parcel has been assessed to establish its capacity to accommodate buildings with and without structural modifications of the tunnel. In almost all instances, the ability to develop more than one to five stories on air-rights will require one or more of the following modifications: a strengthening of the tunnel box top and bottom sections, strengthening of the center wall, and strengthening of the center slurry pile system. Additional structural support in the existing transfer beams spanning the outside slurry wall system could also be required in some locations for some building types.

All such decisions have to be made during preliminary design. Each parcel is unique in terms of its lateral alignment with the tunnel, the depth between the ground surface and top of the tunnel box, slurry wall and grade beam depth, and soil conditions. Each parcel will require further study as engineering work progresses, to determine the maximum carrying capacity and the structural modifications, if any, required to achieve the type of development planned for this parcel. This ongoing process may produce minor design changes in the tunnel, or in specific construction



These urban design guidelines were established to develop a base case analysis of air-rights poten
The process of developing design guidelines will be on-going and involve all appropriate pub c agen
affected neighborhoods, and other interested parties.

1. Reestablish a city circulation system similar to that which existed prior to the construction of
Central Artery to produce a street and block pattern that is in scale with that of each
or district

2. Respect the major pedestrian links connecting activity centers across the corridor's surface st
such as the "Walk-to-the-Sea" and the Haymarket to North End connection

3. Establish parcels of sufficient size, depth, and configuration to permit flexibility in potential deve
ment, and to allow for land uses and densities compatible with the adjacent functional areas

4. Develop general guidelines for new buildings which stress scale and form relationships between
the old and new by maintaining facade planes, emphasizing lateral continuity across the corridor
respecting the architectural character and detailing of adjacent buildings and districts

5. Where ramps or ventilation buildings conflict with existing buildings and open space patterns a
rights development should incorporate them into building envelopes

6. Design building forms and open spaces to reestablish the visual links between functional areas
are presently severed by the Artery

7. Develop open spaces to assist in pedestrian orientation, and to provide visual and physical
for important activities and prominent buildings.

Establish Visual and Pedestrian Corridor

Maintain Sight Line

Facade Planes and Building Forms Reinforce Visual Continuity

Ventilation Building Relocated and Incorporated into Air-rights Development

Open Ventilation Section Relocated to Facilitate Parcel Development

Figure 39
Urban Design Principles
Preferred Alternative
Central Artery from Congress St.
to Causeway St.

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central

echniques, affecting the base conditions for air-rights construction.

The following assumptions eflect the findings of conceptual ngineering:

A one-story building could be arried on the tunnel roof with no dditional structural support required, nd therefore no incremental cost ncrease on any of the parcels.

Buildings of up to five stories an be built in areas where, for each loor of building the tunnel roof is t least two feet below grade. A inimum distance of 12 feet is required between the tunnel roof and the surface to provide for a five-story building. A five-story building can be accommodated without special measures in two locations along the Central Artery corridor.

o Mid-rise buildings could be carried by the system of transfer beams such as those which will support the elevated highway during the tunnel construction period. The slurry walls, beams, tunnel roof, center wall, and center slurry pile system would need to be strengthened to carry an additional load. Pending further analysis, it appears that buildings up to 12 stories high could be supported by this system.

o Taller buildings would require an independent structural system spanning the tunnel. This would be extremely costly, but minor modifications to the tunnel design could allow a shorter span. Building height is also constrained by the lack of subgrade space for structural stiffening against wind loads, mechanical systems and elevator shafts. More sophisticated analysis will be needed in later design stages to determine the feasibility of buildings higher than 15 stories.

2. Ventilation Buildings. Air-rights development may accommodate ventilation buildings. The specific location and configuration of ventilation buildings will be determined following additional detailed air quality analysis. The ventilation buildings may be accommodated in air rights parcels above the depressed Central Artery, or they may be located on parcels adjacent to the right-of-way. The height and appearance of the structures will be guided by air quality requirements and by the requirements of the Section 106 Memorandum of Agreement.

3. Section 106 Memorandum of Agreement. The Memorandum of Agreement (MOA) between the Federal Highway Administration (FHWA), Advisory Council on Historic Preservation (ACHP), Massachusetts Historical Commission (MHC), and Boston Landmarks Commission (BLC) describes mitigation measures which must be implemented to minimize impacts of the project on adjacent historic districts. The architectural and visual character of air-rights development will have to satisfy these Section 106 requirements.

4. Economic Feasibility. Selected parcels were examined to assess the economic feasibility of their development at a range of densities and uses consistent with the urban design objectives described above. Selected parcels were tested using 1983 market data to determine if the required foundation premium exceeds the market value of the "land". The preliminary analysis suggests that the potential return from leasing the air-rights could cover the foundation premium, financing, and administrative costs incurred by the necessary public involvement. As provision of additional subsurface structure to support air-rights buildings must be built at the time the tunnel is constructed, an appropriate public agency or authority will be required to provide the front-end costs and subsequently lease the air-rights to private developers.

ILLUSTRATIVE JOINT DEVELOPMENT

A parcel-by-parcel illustration of possible air-rights development has been prepared on the basis of the design objectives and considerations discussed above. Parcels have been

grouped into seven distinct subareas on the basis of several factors: (1) constituencies that emerged during the preparation of the DEIS/DEIR (for example, Fort Point Channel); (2) constituencies that are well identified from decades of involvement in public issues (for example, the North End); (3) geographic and historic definition (for example, the Bulfinch Triangle); (4) patterns of activity (for example, the Financial District), and distinct problems or opportunities (for example, Haymarket Square). See Figure 40 for a graphic description.

Fort Point Channel

Upper Fort Point Channel, from the existing Dorchester Avenue bridge to the Summer Street bridge, is inaccessible to pedestrians and surrounded by industrial uses. This area, as seen from the Summer Street bridge, is a calm water surface with continuous granite bulkheads that accentuate its length.

In contrast, the Fort Point Channel between the Summer Street and Congress Street bridges is small and well-defined. This area does not have good public access to the water and has not been developed for marine-related commercial or open space uses.

The section north of the Congress Street bridge to the existing Northern Avenue bridge is very different. This is a high activity area and its edges are used for both public and private uses. The public uses include the Tea Party Museum and Children's Museum. Lobster boats, public leisure boat marina and commercial marine activity represent the private uses.

The major joint development opportunities afforded by the project are:

(1) The creation of water-related open spaces that will provide stages for activities, i.e., open spaces for lunching, (2) the re-establishment of a pedestrian connection from South Boston to downtown via New Dorchester Avenue, (3) the creation of a landscaped vehicular entrance to downtown via New Dorchester Avenue (4) the continuation of the City's Waterfront Walk to allow public ac to the waterfront from Christopher Columbus Park to the head of the F Point Channel (see Figure 41).

With the Preferred Alternat development opportunities created reinforce the Channel's attractive (see Figures 42, 43, and 44). New Dorchester Avenue will allow the entire Channel to be accessible to public use, providing an alternati route to downtown for the South Bo community.

The relocation of Dorcheste Avenue will result in the creation two new parcels of land. One of t parcels is at the head of the Chan and could be developed for a publi use, such as a park or boat landin The other parcel, about one acre i size, is adjacent to Gillette Comp property. This parcel could be acquired by Gillette to provide la to build a new headquarters, furth improving the quality of developme around the Channel.

Consistent with the Section Memorandum of Agreement, a boardwa below the New Dorchester Avenue st level would be designed within the Channel, thus providing a separati between vehicular and pedestrian traffic. This boardwalk would ext from the headwall at the existing Dorchester Avenue Bridge along the bulkhead. From the lowered boardw pedestrians would have the opportu to relate more directly to the wat based activities which contribute the Channel's historic character.

As the boardwalk approaches Summer Street Bridge, the tunnel b (which had been under the Channel) emerges and causes a shift of the bulkhead and creates a surface dec area of 35,000 square feet.

This tunnel box provides th opportunity for a recreational ope space easily accessible to downtow Boston office workers. Lightweigh

After Construction – One Joint Development Option

Decisions about air-rights development will be made during the on-going participatory planning process. This drawing represents only one possibility with buildings, parks and pedestrian walkways. These public open spaces occupy approximately 35% of the land available for joint development

Figure 40

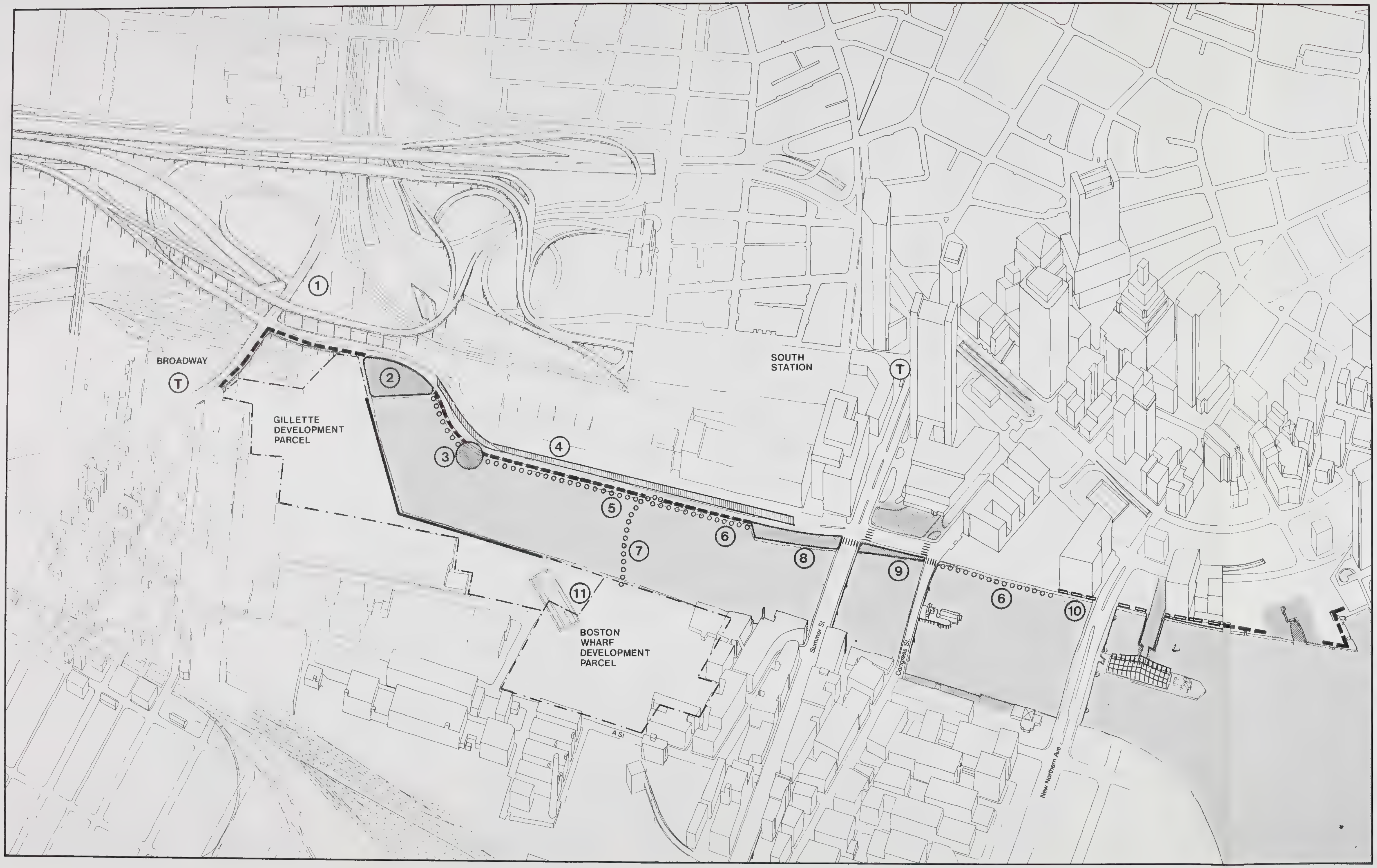
Illustrative Plan

Preferred Alternative

Central Area from Congress St. to Causeway St.

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery



Urban Design Objectives – Fort Point Channel

1. Provide architectural treatment and reduce scale of ventilation building to lessen visual impact
2. Create public open space with access from Dorchester Avenue for recreation and possible marina us
3. Provide visual landmark at focal point on pedestrian walkway
4. Provide landscaping as visual buffer between Post Office loading docks and New Dorchester Aven
5. Provide landscaping, pedestrian level lighting, architectural railings and steps and ramps to pedestr boardwalk along street level sidewalk to improve pedestrian experience.
6. Lower pedestrian boardwalk to provide visual separation from vehicular traffic and to bring people in closer proximity to the water.
7. Pedestrian bridge could connect boardwalk to existing and planned activities on the east side of the Channel.
8. Design public recreation decks with outdoor commercial activities to be built over tunnel box. Maintai linear plane of granite bulkhead line to preserve the symmetry of the Channel south of the Summer Street Bridge.
9. Design decks over the tunnel box for public recreation use. Elevation and material of the decks shou minimize impact on existing bulkhead and bridges.
10. Completing pedestrian link between Harbor Plaza building and U.S. Customs building would result in a waterfront pedestrian walkway from South Boston to Waterfront Park.
11. Louvers and landscape screening lessen impact of tunnel open section. New structures on air-rights would be possible if side louvers are provided for ventilation.

- Proposed Pedestrian Link
- Grade Separated Pedestrian Link
- Existing Open Space
- Proposed Open Space

Figure 41
Urban Design Objectives
Preferred Alternative
South Bay/Fort Point Channel

0 200 400 Feet

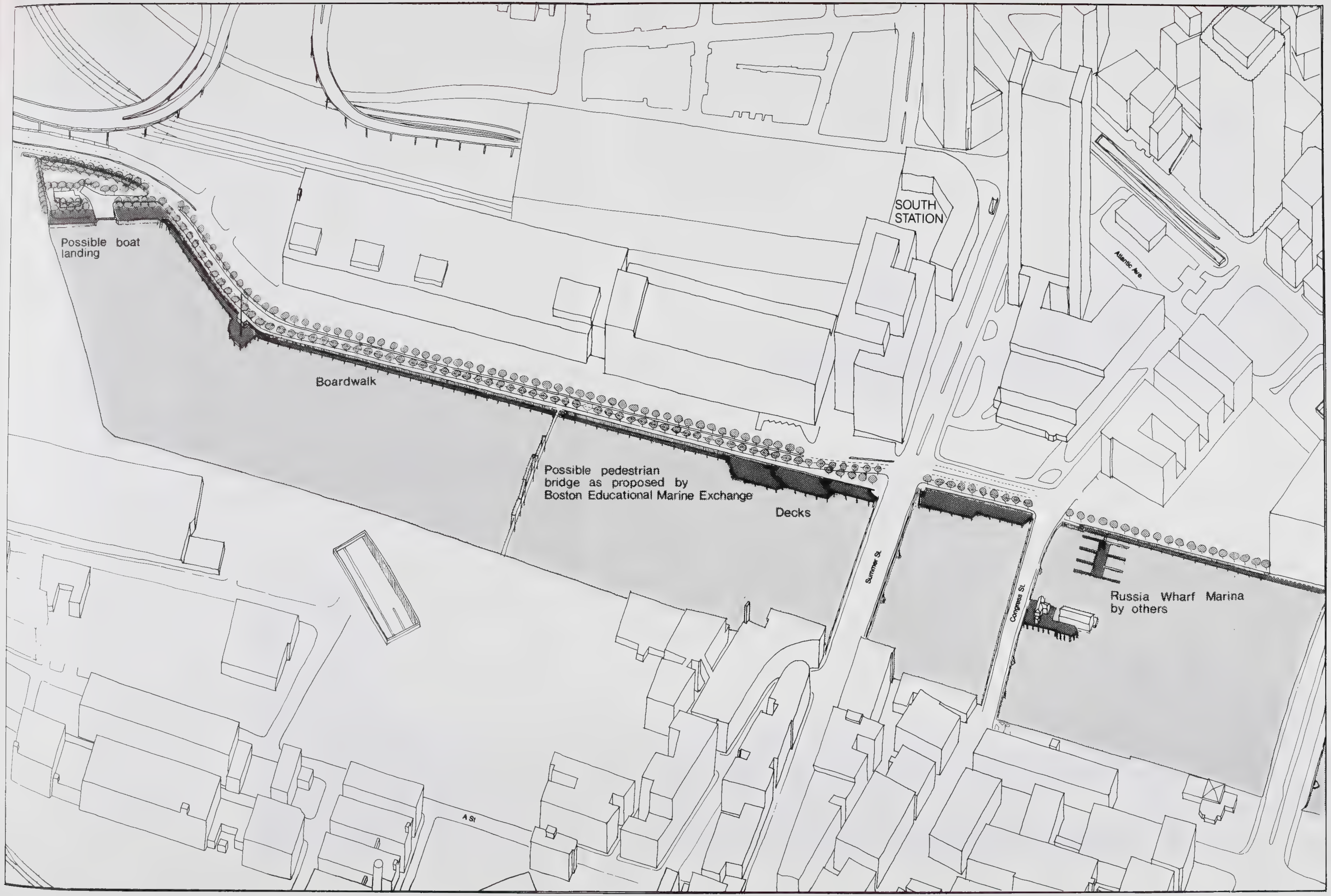


Figure 42
Illustrative Plan
Preferred Alternative
South Bay/Fort Point Channel

0 200 400 Feet

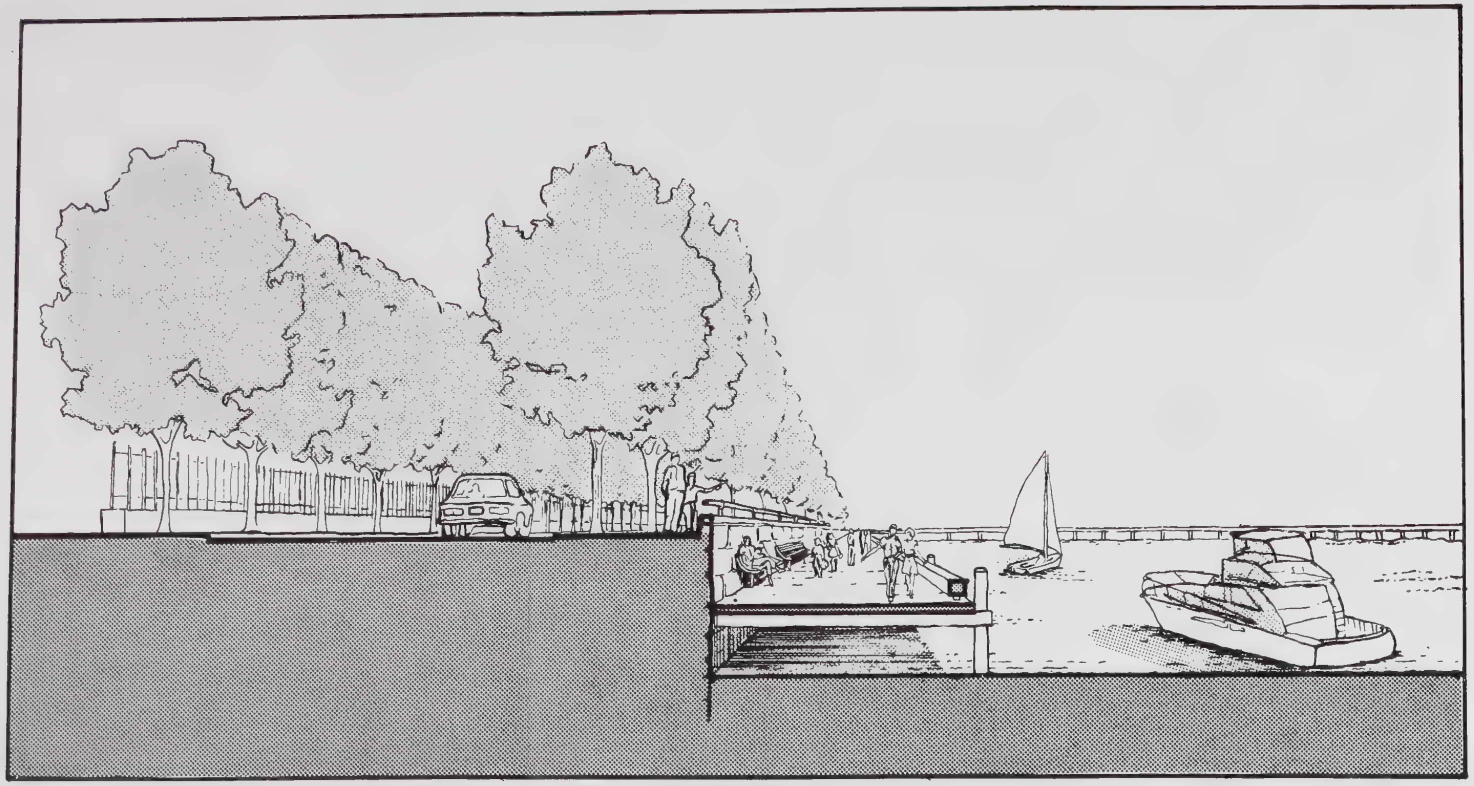
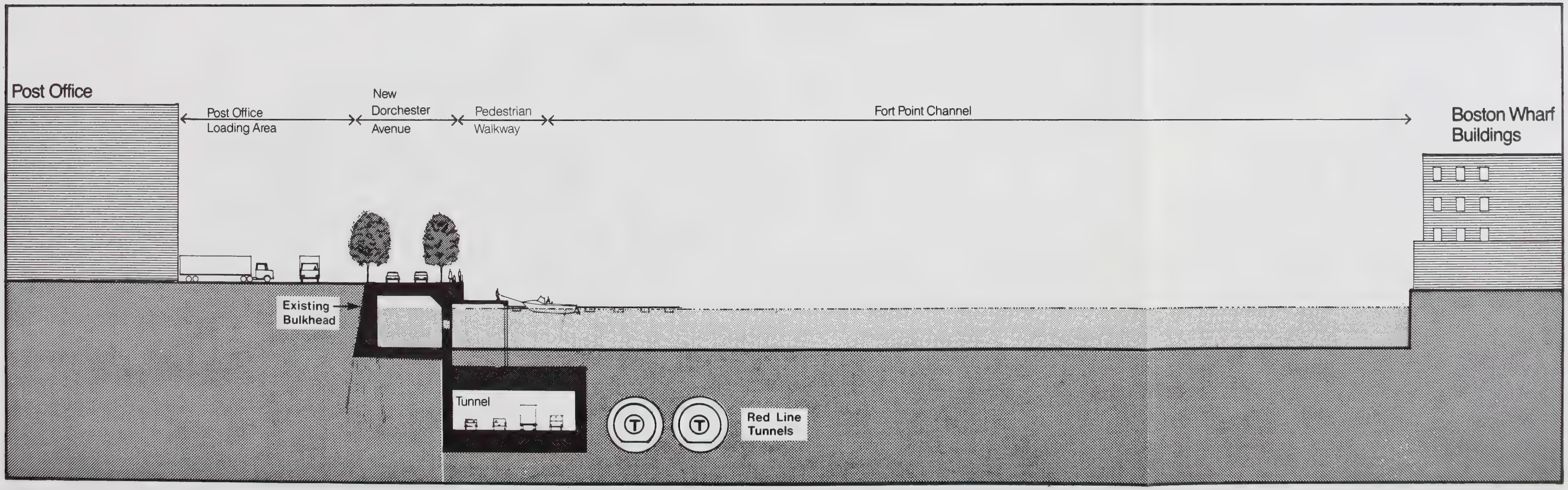


Figure 43
Cutaway View from Boardwalk Along New Dorchester Avenue (Looking North)
EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Artery

Figure 44
Illustrative Section through Fort Point Channel South of Congress Street (Looking North)



structures could be located here to
huse food services catering to the
lnchtime users. As the tunnel box
proceeds north along the Channel
blkhead, another deck is created
btween the Summer Street and Congress
Sreet bridges. Due to the proximity
c the decked area to the Federal
Rserve Bank, the opportunity would
eist to extend the Bank's Sculpture
Grden to the waterfront, tying the
to open spaces together. The tunnel
bx continues north, curving into the
eisting bulkhead line. North of the
Cngress Street bridge, the tunnel
mrges into the existing bulkhead line
ad has a minimal impact on this area
o the waterway.

Construction of a new granite
blkhead in this section allows for
the extension of the public walkway to
the northern limit of the project.
hrough coordination with the property
wners along the western edge of the
hannel, the public walkway could
xtend further providing continuous
aterfront access from the Fort Point
hannel to the Waterfront Park and the
quarium.

The potential for marina
evelopment is limited by the availa-
ility of accessible parking. How-
ver, a pedestrian bridge over the
hannel could be designed that would
rovide access to the eastern side of
he Channel at the Boston Wharf
roperty. This bridge could provide
ccess to parking areas in the Fort
oint Channel warehousing area.

<u>inancial District</u>

The transition from an elevated
entral Artery to the Dewey Square
unnel occurs in this subarea; this
ransition section, together with the
any on- and off-ramps, creates the
ongest barrier in the corridor
tretching from Congress to High
treets. Removing all of these
lements will allow the reestablish-
ent of the street and block pattern
hat existed prior to the Artery
construction in the 1950s; the Finan-
cial District will again be connected
to the Harbor, Fort Point Channel and
the industrial/waterfront section of South Boston (see Figures 45 and 46).

However, the physical character and land uses in the area have changed dramatically in the interim and will continue to change as the new Northern Avenue Bridge, Rowes/Fosters Wharf, and proposed Fort Hill developments proceed into construction over the next few years. This distinguishes the Financial District subarea from the others in that any planning for joint development over the tunnel must be carried out in concert with planning efforts for adjoining parcels and public improvements to a greater degree than in other subareas.

o <u>Parcel 1</u> is approximately 32,000 square feet. Although it is free of any ramps or ventilation buildings, more analysis will be required to determine the nature of structural constraints placed on any air-rights development by the retention of the existing tunnel walls in contrast to the rest of the corridor where a new slurry wall system will be in place.

o <u>Parcel 2</u>, between Pearl and Oliver Streets, is 62,000 square feet, but is constrained by the placement of a southbound exit ramp and an opening in the new tunnel roof for ventilation of the existing Dewey Square Tunnel.

o <u>Parcel 3</u> is the largest at 90,000 square feet and, like Parcel 2, is similarly constrained by a northbound on-ramp and currently by the combined mass of two ventilation buildings in the center of the parcel.

The context of all three parcels is similar in some respects: the buildings on adjacent sites vary from 6 to 30 stories in height and there are still some large undeveloped sites; the predominant land use is office with some retail at the ground level; and proximity to the Waterfront would allow views of the Harbor and Fort Point Channel from potential future buildings on the air-rights parcels.

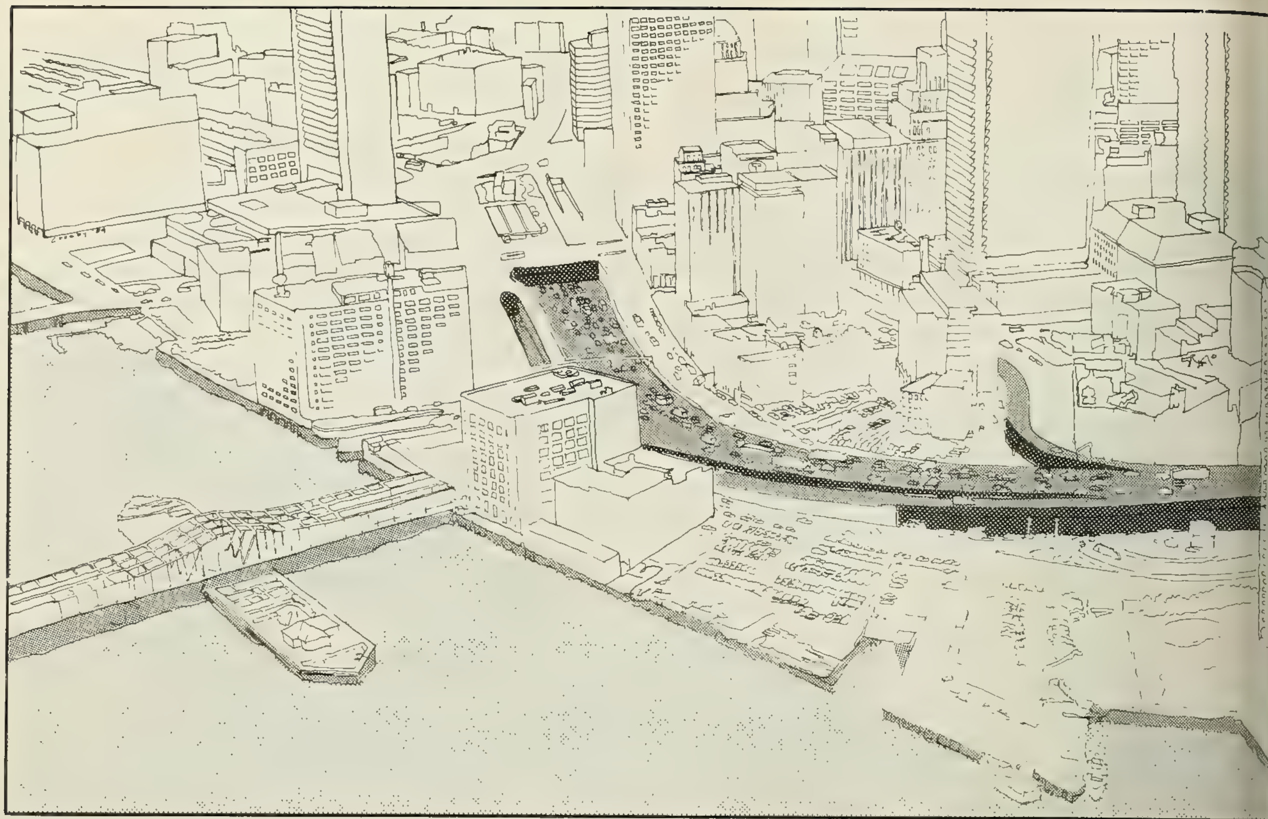


Figure 45

Existing: Aerial view of the Financial District from Congress Street to High Street.

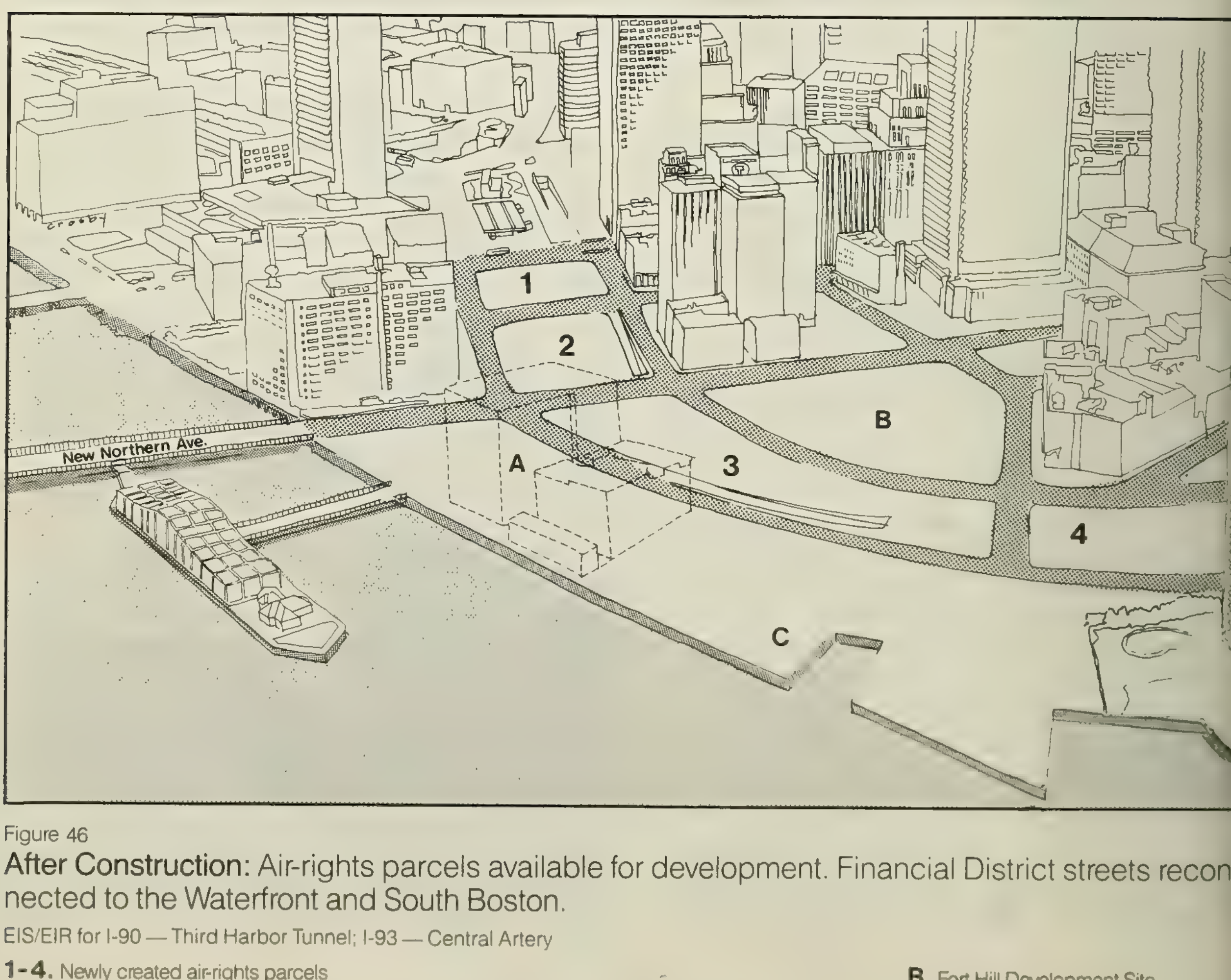


Figure 46

After Construction: Air-rights parcels available for development. Financial District streets reconnected to the Waterfront and South Boston.

EIS/EIR for I-90 — Third Harbor Tunnel; I-93 — Central Artery

1-4. Newly created air-rights parcels

A. Buildings not taken, they are shown in outline form to illustrate new surface street pattern

B. Fort Hill Development Site

C. Rowes and Fosters Wharf Developme

It is reasonable to assume that
milar uses would be proposed for the
w parcels and that housing might be
ssible on the north end of Parcel 3
ar Rowes/Fosters Wharf. One of the
st positive changes is the possibil-
y of providing active retail uses on
e major pedestrian corridors from
e Financial District down Congress
reet to the Fort Point Channel, Tea
rty Ship, and Children's Museum;
wn Oliver Street to the new Northern
enue Bridge and South Boston water-
ont development area; and down High
reet to the public ferry landing on
wes/Fosters Wharf.

The height and density of
velopment on Parcel 1 will be
etermined in part by its structural
earing capacity and on Parcel 2 by
e ability to maintain an open
entilation section and ramp while
eeting the ground floor access and
ertical circulation requirements of a
id-rise office tower.

Parcel 3 presents a very
ifferent opportunity. It is an
xtremely long parcel and can accom-
odate the ramp and ventilation
tructures within a development
uilding envelope, possibly in a
arage structure. The parcel is
ocated at a sharp bend in the cor-
idor, and this, coupled with its
ength, suggests that the relationship
f building forms to open space and
edestrian paths must be carefully
orked out so that the disorienting
arrier effect of the existing transi-
ion section is not repeated. Provi-
ion of second level connections
etween the Fort Hill and Rowes/
osters Wharf developments across this
arcel is also possible.

Broad Street

This historic area developed rapidly with Boston's growing importance as a port city in the 19th century. Many of the buildings associated with this era remain, but they are severed from the harbor by the Central Artery; those adjacent to the Artery are altered in scale and appearance by the proximity of the large steel structure. Removing the Artery presents an opportunity to reconnect this district to the waterfront, create a series of small open spaces around and between these buildings, and expand the mixed use neighborhood on three new air-rights parcels.

Parcels 4, 5 and 6 extend from High Street to State Street. A ventilation building has been proposed to be located in the general vicinity of these parcels. The specific location and configuration of the required ventilation structure will be determined following additional detailed air quality modeling and analysis.

Each of the three parcels could be developed for office or residential use on the upper floors and office or retail use on the ground floor with parking provided in each or all of the parcels as needed. There are established markets for both office and residential space in this area, and the creation of new mini-parks and pedestrian walkways to the waterfront should enhance the marketability of the three air-rights parcels.

There are two types of public open space opportunities: (1) Landscaped pedestrian "links" across the parcels at High, Broad, India, Milk, and Central Streets (see Figures 47 and 48) and, (2) A linear sequence of small parks along the irregular edge of buildings parallel to the southbound surface Artery (see Figures 49 and 50). Many of these are buildings which were truncated, during the Central Artery construction in the 1950s with the notable exception of the Grain Exchange Building whose windows face directly into the highway's columns and girders. Removing the viaduct will allow the development of a radically different environment for these older historic buildings.

o On Parcel 4, the building forms could define new plazas at the important pedestrian crossing where High and Broad Streets intersect and at the other end of the parcel where India

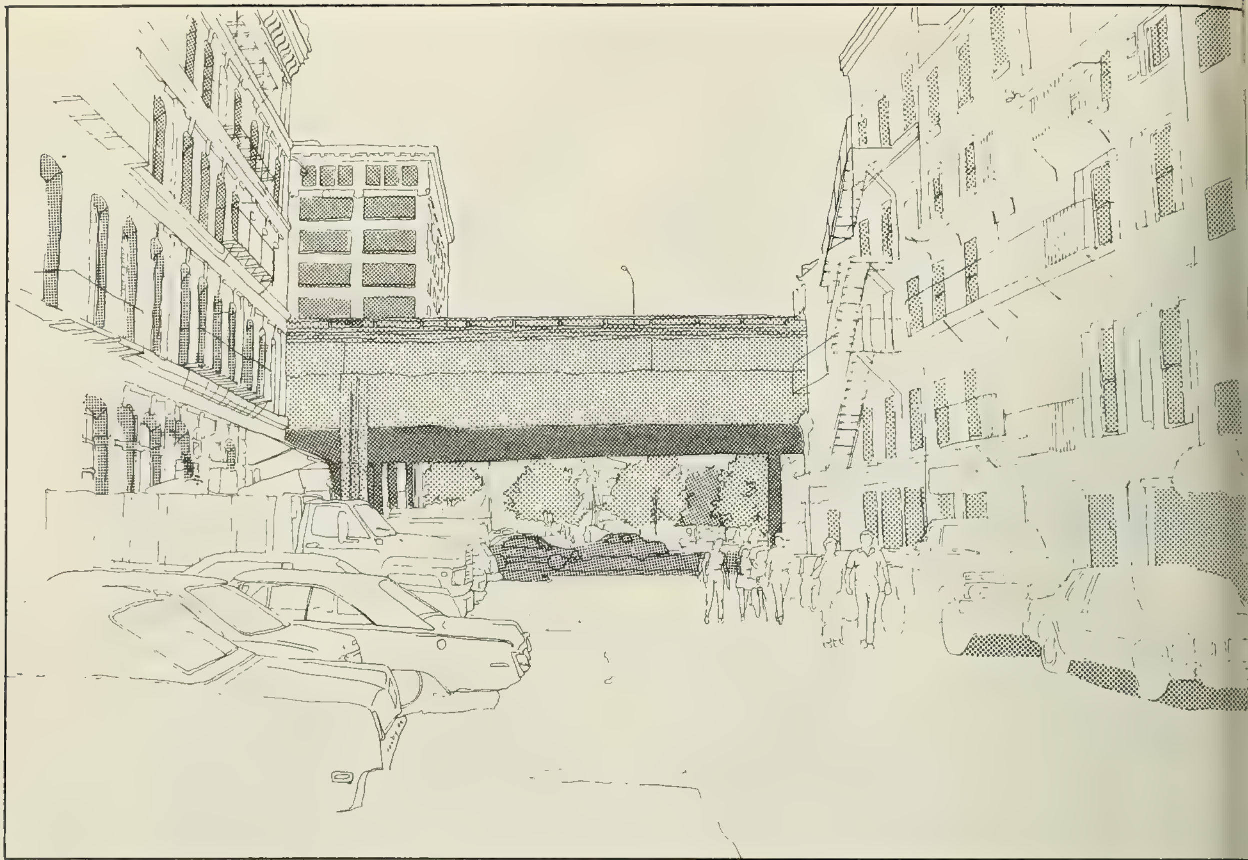
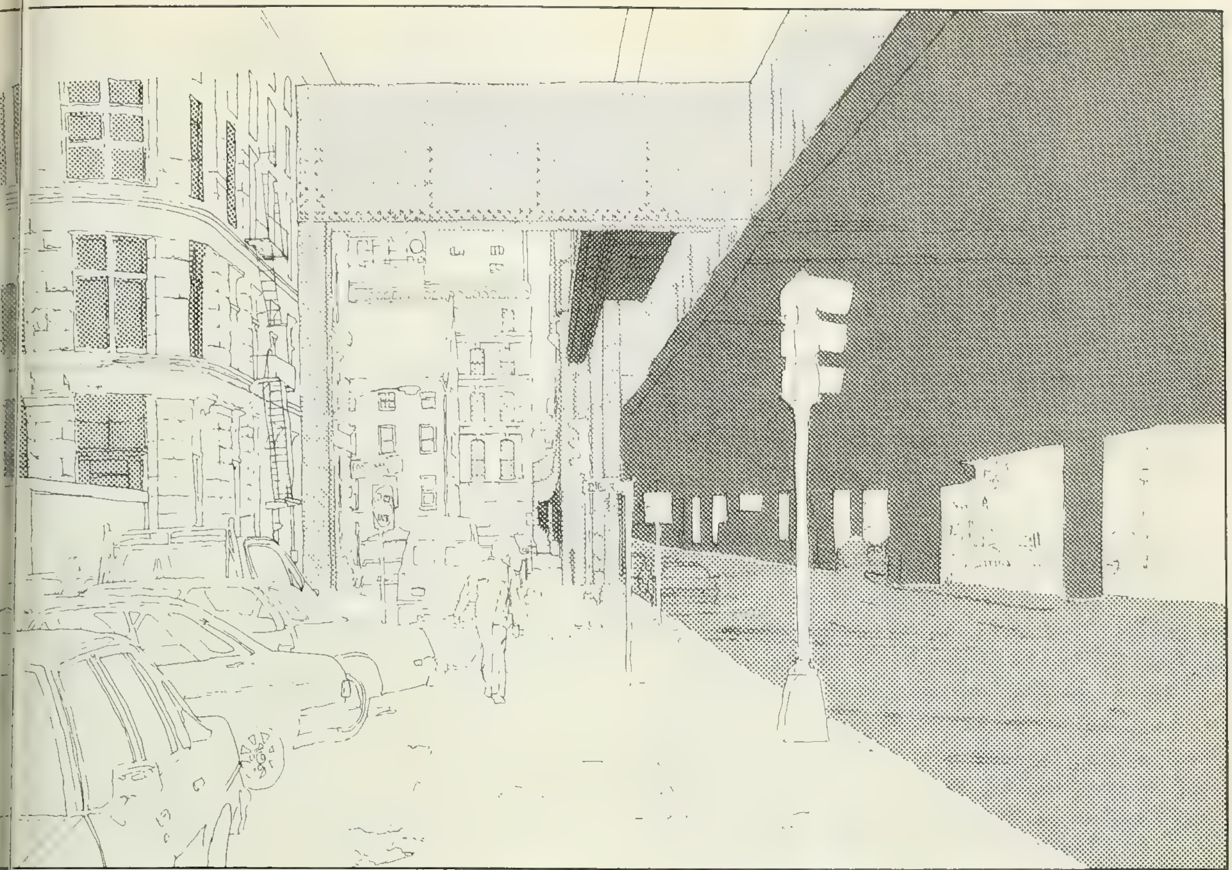
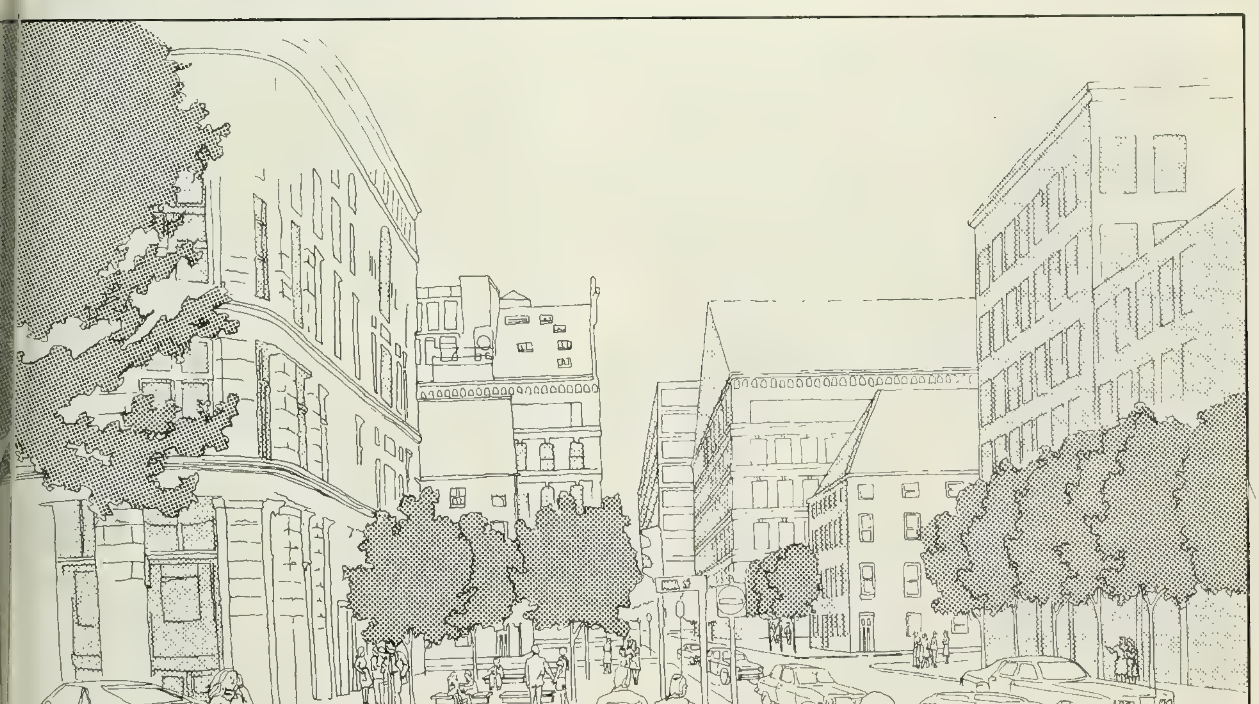


Figure 47
Existing: View toward the harbor along Central Street.

Figure 48
After Construction: View toward the harbor and the Aquarium along Central Street, illustrating air-rights development – one option.



ge 49
sting: View looking north along the Surface Artery adjacent to the Broad Street District.



re 50
ter Construction: View toward the harbor and the Aquarium along Central Street, illustrating
-rights development – one option.

Street crosses to the Waterfront. Broad and India Streets intersect the new parcels at an oblique angle, creating an interesting design opportunity for both buildings and open spaces.

o A building on Parcel 5 should respect the diagonal geometry of India Street at one end and the 90 degree geometry of Milk Street at the other end; its design should respect the preeminence of the Grain Exchange Building.

o Parcel 6 offers an opportunity to create a pedestrian mall at the end of Central Street connecting McKinley Square and the U.S. Customs House area with the Waterfront and the Aquarium Plaza. Building forms on this parcel could replicate those of the remaining sections of the State Street block and Central Wharf, thus, reestablishing visual continuity between the historic Broad Street District and the Harbor that generated its development.

Waterfront

This subarea extends from North Street to High Street and includes two large parcels. Parcel 7, between High and Clinton Streets, is approximately 80,000 square feet and is not encumbered by any new tunnel elements; the smaller Parcel 8 (40,000 square feet), however, accommodates a northbound exit ramp, the Callahan Tunnel entrance ramp, and possibly a ventilation building. These elements, plus the narrow width of the parcel, make it considerably more difficult to develop than Parcel 7.

The context of the two parcels is quite different in terms of both the physical character of adjacent blocks and the types of uses within. Parcel 7 offers an opportunity to strengthen two important pedestrian connections and retail corridors: State Street to Long Wharf and Quincy Market to the Waterfront Park, Marriott Hotel and Mercantile Wharf. The parcel is flanked by heavily used public spaces and active ground floor stores and restaurants including the new Marketplace Center, now under construction.

o Parcel 7 offers a very diff-ent type of opportunity. The "Wal to-the-Sea" could be extended thro a skylit gallery or an open mid-bl pedestrian walkway with ground flo retail space on either side. A lo block to the north could be used f office space or housing on the upp floors as could those of a higher building to the south parallel to State Street. The gallery or walk would be the last link of the pede trian axis from Government Center Plaza to the harbor, occupying a pivotal location along that axis; t could extend the linear path from South Market Street through Market place Center and then open out to afford views of the Waterfront Par As viewed from the Park, it would appear as an entrance to the city underlining the importance of this major pedestrian walk.

o Parcel 8 is flanked by the blank masonry facade of the Quincy Market garage on one side and the walls of residential buildings alo Commerical and Fulton Streets on t other side. The many constraints placed on this parcel suggest that might be a logical candidate for a small parking garage, possibly com bined with a recreation deck. A garage could span the tunnel ramps incorporate the ventilation struct more easily than other building ty and could be connected to the exis parking garage or to a new replace parking structure on Parcel 9. At south end of Parcel 8, at the intersec- tion of Clinton Street a the new Surface Artery, a mini-par connecting Commercial street with Quincy Market is a possibility (Se Figures 51 and 52).

North End

The North End extends from Fulton to Endicott Streets and inc-porates two large new parcels, bet Blackstone and Cross Streets, and smaller parcels within existing bl on the North side of Cross Street.

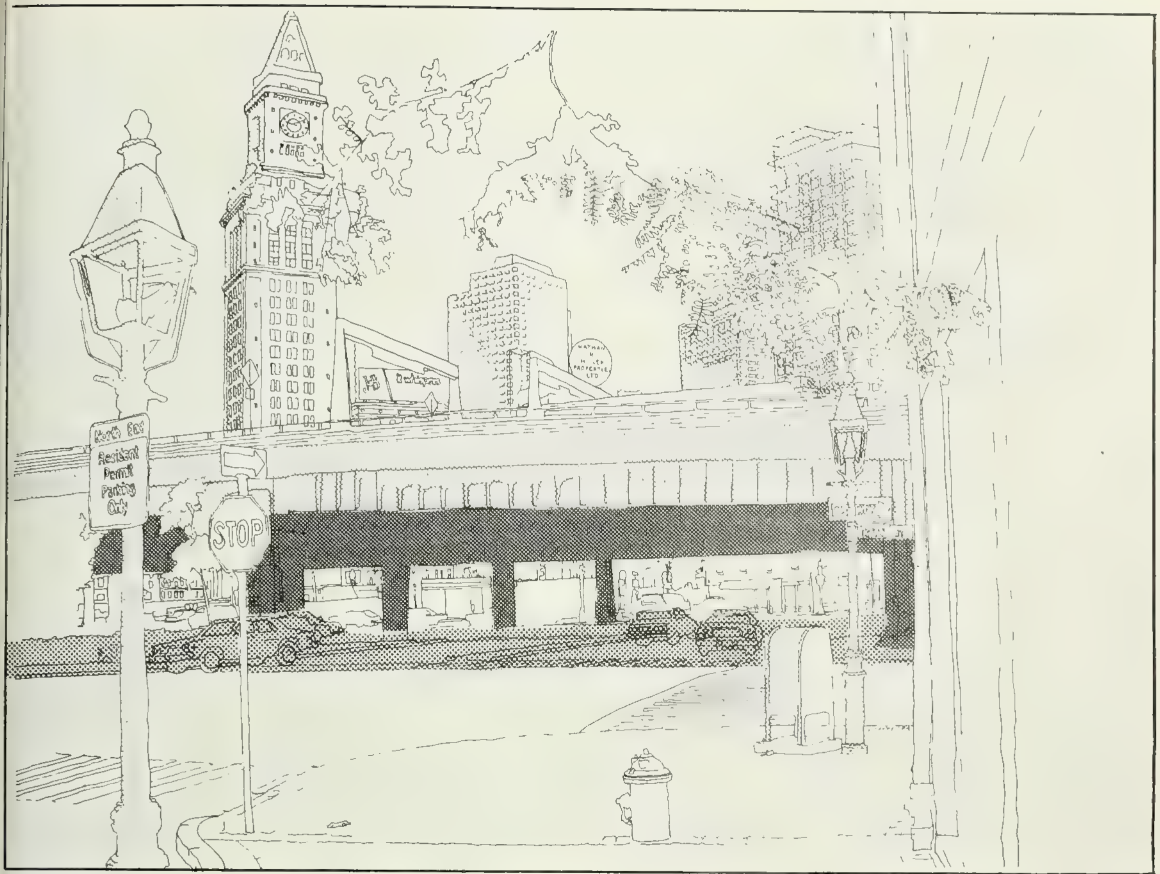


Figure 51

Existing: View under the Central Artery toward Quincy Market from Commercial Street.

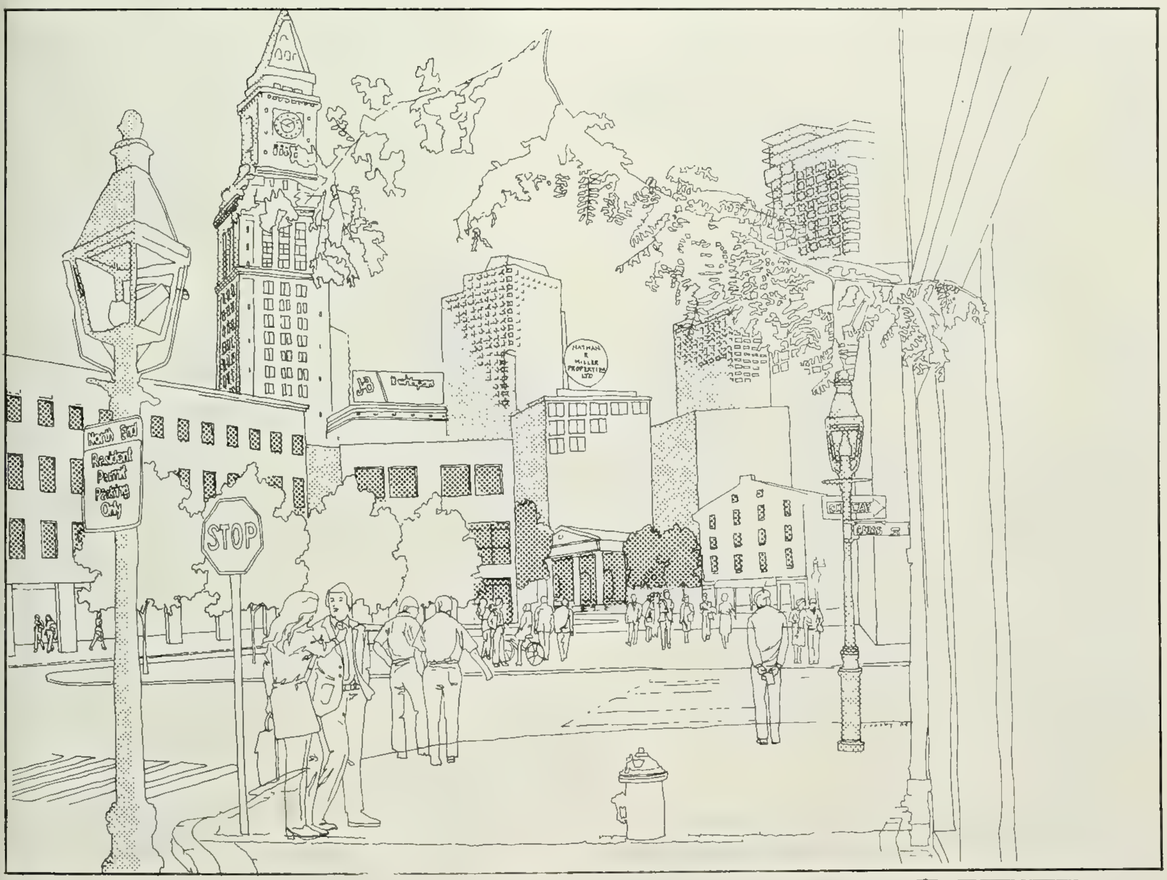


Figure 52

After Construction: View toward Quincy Market from Commercial Street across a landscaped pedestrian walkway – one option.

The principal joint development opportunities afforded by the project in this subarea are: (1) the reestablishment of a connecting network of streets and pedestrian walkways between the North End and Downtown; (2) sufficient ground floor space in potential buildings on Parcels 11 and 12 to expand the area's existing food-related commercial activities and to connect the Blackstone Street Markets with the Cross, Salem, and Hanover Streets commercial area; (3) upper floor space on all four parcels which could be used for offices, housing, recreation and other community facilities; and, (4) a series of small plazas which could enhance the neighborhood and be used for both recreation and outdoor commercial activities.

It has been assumed in examining the range of possibilities for reuse of the land on these parcels that new buildings would be in scale with existing North End buildings, and that new streets and plazas would reflect the scale and character of the North End. The Artery as a barrier would disappear and, although the North End and Downtown would be physically reconnected, the placement of new buildings and the uses in these buildings could provide a new and stabilizing edge to the North End.

o Parcels 9 and 10: These two parcels could accommodate buildings, garages, or public open space on air-rights over the existing tunnel entrances. New buildings in the general height range of adjacent structures on Hanover and Fulton Streets would allow 100,000 square feet of space for retail, housing or other commercial activities. An open plaza in front of the handsome neoclassical Police Academy Building would provide a better setting for this building and would facilitate pedestrian movement along Cross Street where today the open tunnel entrances inhibit safe passage.

o Parcel 11: This block could be the connecting link between Downtown and the North End. A diagonal pedestrian walkway from Hanover Street [illegible] the Haymarket could tie together t[illegible] commercial activities now severed [illegible] the Artery (see Figures 53 and 54); ground floor retail stores in new buildings flanking this walkway wo[illegible] further reinforce this connection. Low-rise, walk-up housing or offic[illegible] space could be developed on upper floors; the total square footage o[illegible] all floors would be in the range o[illegible] 200,000 square feet. On the downt[illegible] side, a widened sidewalk and pedestrian island would provide a new a[illegible] enlarged home for the Haymarket pushcarts; and on the North End si[illegible] a small plaza could serve as an entrance to the North End at the important intersection of Hanover [illegible] Cross Streets.

o Parcel 12: Two new ramps bisect this block restricting grou[illegible] level circulation across the corridor. However, there is sufficient depth between the ramps and parall[illegible] surface streets to accommodate ret[illegible] uses; Cross Street would then bec[illegible] conventional two-sided shopping st[illegible] with additional food markets, rest[illegible]rants or other activities replacir[illegible] the Artery's steel structure. The parcel is large enough (85,000 squ[illegible] feet) to provide for large floor a[illegible] on air-rights above the two ramps; community recreation facilities wo[illegible] be possible on these large floors.

Haymarket Square

This subarea is markedly different from others in the proje[illegible] corridor. There are no major parc[illegible] to develop; in contrast, this area [illegible] dominated by the surface road syst[illegible] Haymarket Square historically has [illegible] a crossroads for transportation routes. It remains so today, and [illegible] become more so in the future.

Haverhill and Beverly Stree[illegible] will reconnect to the Square servi[illegible] as access roads to and from the ne[illegible] ramps at Causeway Street, and two additional ramps (the Sumner Tunne[illegible] exit ramp and a southbound surface [illegible] Central Artery entrance ramp) will connect directly to the Square. T[illegible]

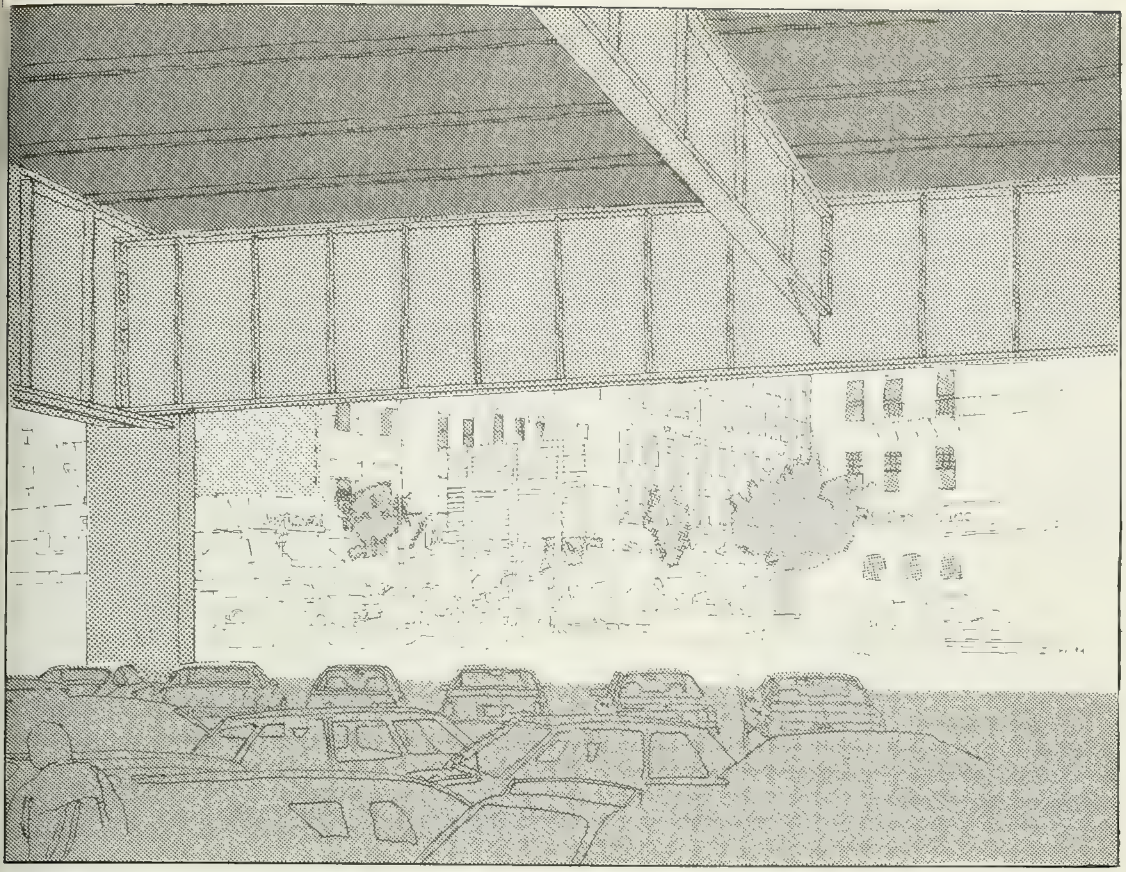


Figure 53
Existing: View toward Hanover and Cross Streets from under the Central Artery.

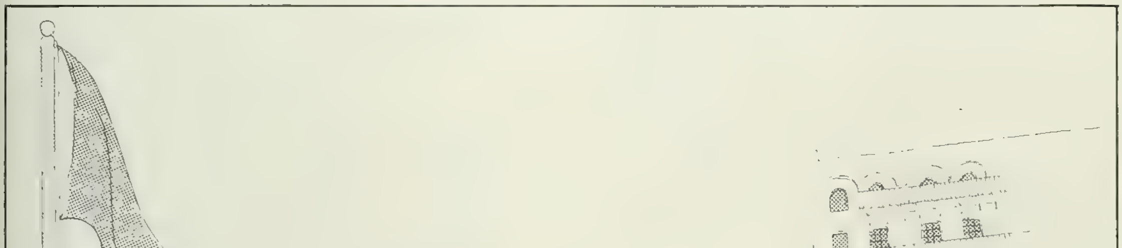


Figure 54
After Construction: View toward Hanover and Cross Streets across a small plaza – one option.

new roadways, added to the existing street network, Government Center Garage, MBTA bus station, Green Line, and Orange Line Stations, focus on a small but visually prominent corner of downtown Boston. In fact, Haymarket Square is the visual entry point into Boston for several routes and for all of the approaches from the North.

Four issues are paramount from a joint development, surface area design point of view: (1) how to buffer the North End residential area from this busy intersection; (2) how to facilitate pedestrian circulation through the Square, especially the connection between the North End and MBTA stations; (3) how to avoid visual clutter disorienting to motorists and pedestrians; and (4) how to design the new elements within the Square to serve as an appropriate "entrance" into downtown.

o Parcel 13, approximately 30,000 square feet, extending from Endicott and Cooper Streets between the North End and Haymarket Square, offers an opportunity to design a noise and visual buffer between the two areas. This could take the form of an architectural wall - perhaps characteristic of North End homes replicated on the surface. Landscaping or a small recreation area on the parcel could be incorporated into the design.

Pedestrians would be able to cross at grade between the North End and the Haymarket MBTA station, but a grade-separated crossing would be possible. There is sufficient vertical clearance between the tunnel roof and street level to construct a new pedestrian entrance from Parcel 13 in the North End to the Orange and Green line platforms at Haymarket. Skylights could be placed in traffic islands above this pedestrian connection which, in effect, would be a new entrance to the station for North End residents.

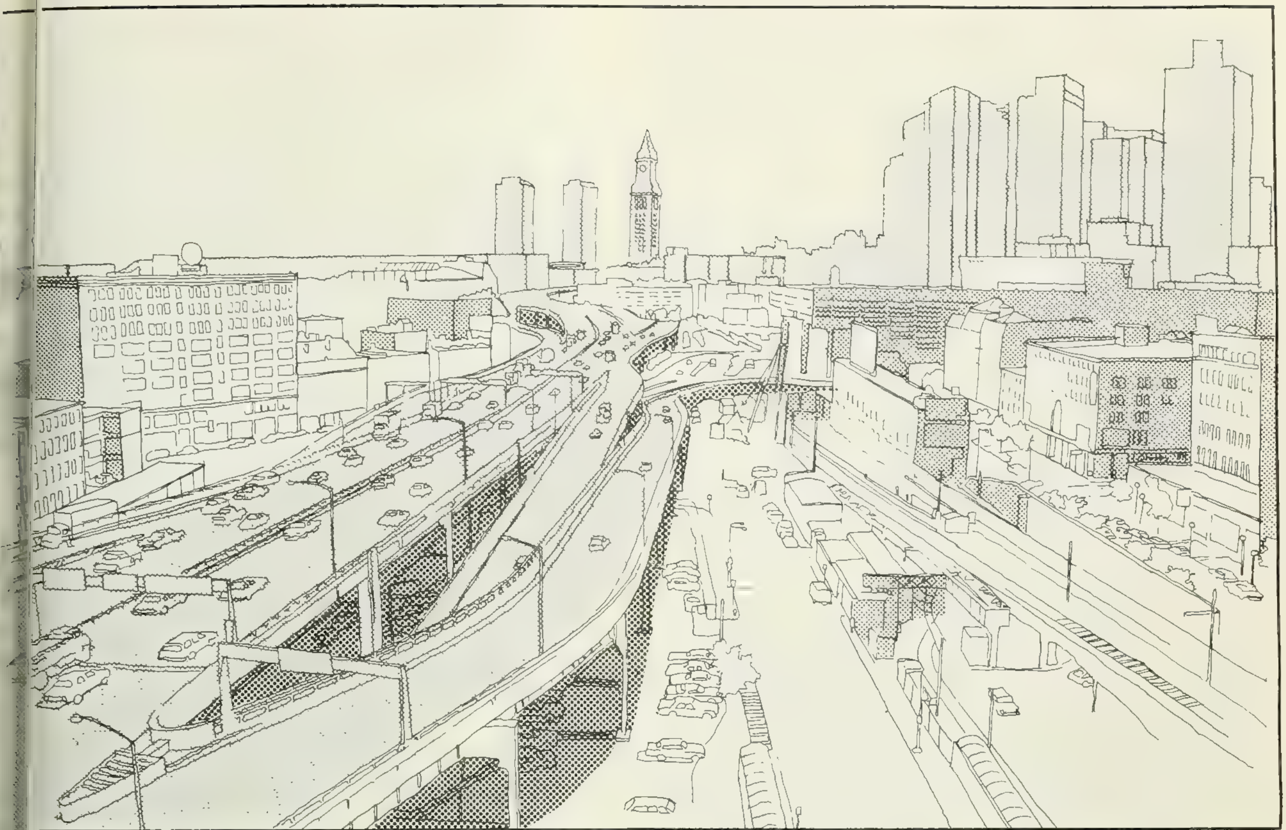
The surface street system in Haymarket Square will receive much more attention in the preliminary design phase and a parallel effort will focus on the visual character of the surface environment. There are various approaches to finding a solution for the problem of creating "order" within this environment of traffic islands dominated by signs, signals, and lights. In some ways area is analogous to Boston's Kenmore Square; the search for a design solution appropriate to this gateway into Boston should center on an image which signifies the historic and s vital importance of Haymarket Square.

Bulfinch Triangle

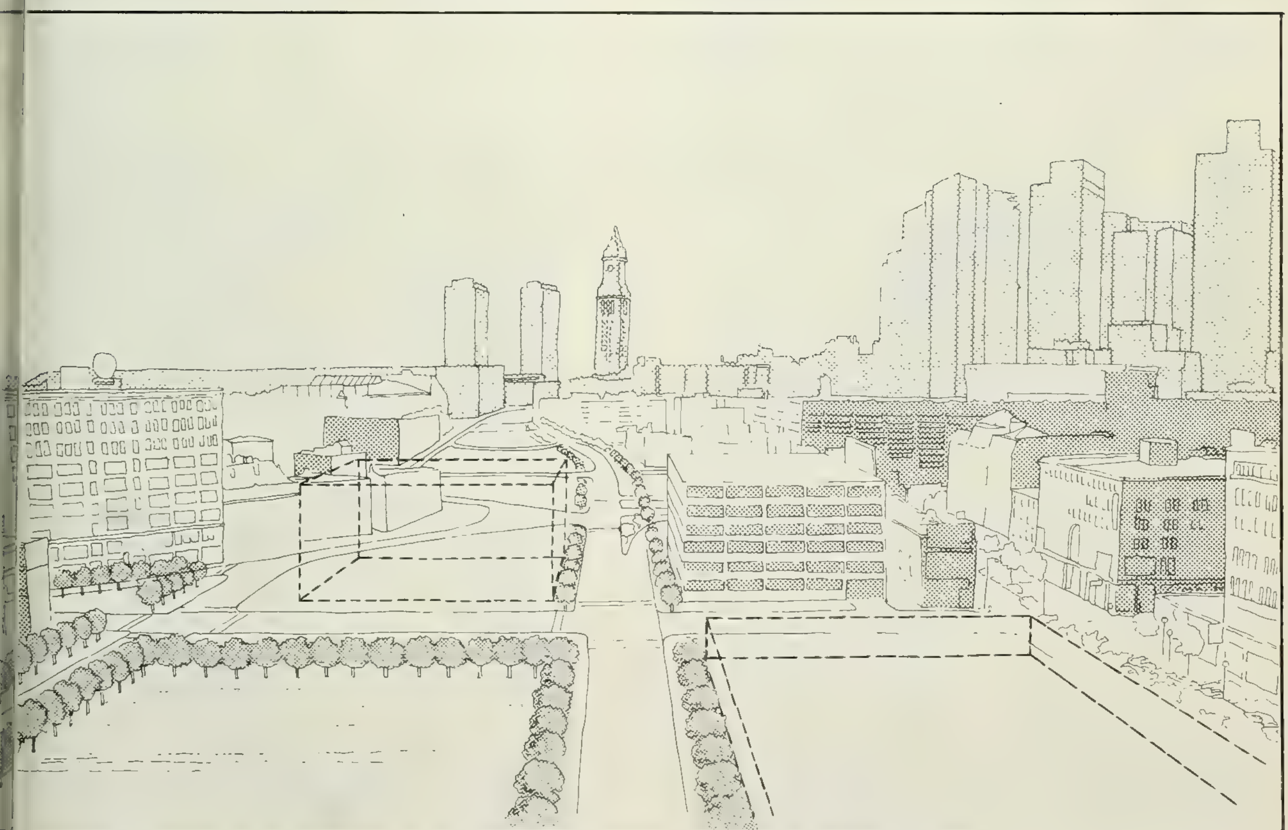
The Central Artery viaduct spans two large parcels which, once covered, could be redeveloped to reestablish the physical character of the historic Bulfinch Triangle, and provide over 2.5 acres for new land uses (see Figures 55 and 56). The portion of the Triangle between Ca and Beverly Streets has always been severed by transportation corridors: a canal, a railroad, the Orange and Green Lines, and finally the Central Artery. The canal and railroad were removed many years ago, the Orange Line was depressed in the 1970s, a an alternative for reconstructing e Green Line in a tunnel is under study. Removing the Artery would allow the North Station/Bulfinch Triangle area to grow back togethe over this corridor and to connect t the rest of the city.

The area is characterized b a mix of office and industrial uses some retail and restaurants on the ground floor level. The buildings principally late 19th and early 20 century masonry structures which v in height; most are in the six to story range.

o Parcels 14 and 16 can be developed at comparable densities provide between 500,000 and 750,000 square feet. Office and light industrial uses would be possible; the large floor areas attainable on the parcels would be suitable for either although the area is far removed f



s fig: View looking south from Causeway Street.



re 6
e Construction: Air-rights parcels available for development. Bulfinch Triangle surface street st m restored.

the Financial District and perhaps not marketable for Class A office space.

A new housing complex is another possibility. Although it is difficult to envision today, the environment will be radically altered when the Artery is removed, and there are several good reasons to consider housing: access to public transportation; proximity to the North End, and its convenience and service retail areas; views from upper floors of the Charles River Basin, Harbor, North End, and Charlestown Waterfront; and proximity to the potential amenity of two new landscaped parks.

o Parcel 15: a small urban square is a likely use for this triangular parcel bound by North Washington, Traverse, and Beverly Streets; it would be comparable in scale to Post Office Square and would face the tallest building in the North End as well as the two new development parcels. On the other side of these parcels, a linear parcel extending from Causeway Street to Haymarket Square would replace the existing Haverill Street. This long, narrow parcel rests on top of the Orange Line tunnel and could be developed as a landscaped mall linking the North Station area with Haymarket Square and Government Center. It has also been identified as a possible site for a new garage providing replacement parking for lost spaces under the Artery.

JOINT DEVELOPMENT PROCESS

General Policies

The illustrative design work completed during the EIS/EIR process is the first step in a process that must continue through the project construction period and subsequent availability of development parcels. This work is an essential part of the task of preparing imaginative and realistic plans, and of designing an effective mechanism for facilitating and controlling development. What follows represents an initial statement of the Commonwealth's policies regarding this important joint deve opment process.

o Continuity. Whatever the fi disposition of development parcels, the state will continue an ongoing open process involving the city and other public agencies and private citizens, especially those in neigh borhoods adjacent to the Artery corridor. The need for this contin ity was emphasized in comments on the SDEIS/SDEIR and in testimony presented at the public hearings. is particularly important to mainta activity between the publication of this FEIS/FEIR and the start of preliminary design work.

o Coordination and Overall Responsibility. Continuing state involvement will be required to develop mechanisms to finance the costs of future building foundation and to enforce design guidelines fo the new development. As the princi proponent of this project, the Commonwealth will be responsible for coordinating and implementing sensi tive and environmentally sound join development within the project corr dor.

The new land created by the Artery depression will be owned by Commonwealth, and the ongoing opera tion and maintenance of the highwa facility will be a Commonwealth responsibility. State leadership be required in pursuing any needed legislation. Close coordination m be maintained with the City of Bos as various city departments will p a central role in this process. T Boston Redevelopment Authority has indicated the project's general conformance with both specific pro plans and more general planning activities, and has expressed a st interest in participating actively the continuing planning process.

o Local Involvement. Represen tives of affected neighborhoods wil have an active role throughout the process. Participation should be organized around geographic subarea containing groups of parcels with

common development issues and of concern to neighborhood groups. Procedures for membership and participation will be defined, primarily to assure continuity of participation throughout the process of planning, design, construction and development. The specific responsibilities of these groups, and the mechanisms by which they will interact with public officials, public agencies and with project designers, are covered further in the following discussion of a proposed three-stage planning process.

The Executive Office of Transportation and Construction (EOTC), and the Massachusetts Department of Public Works (MDPW) will be responsible for providing appropriate technical assistance to these groups. Prospective developers will be required to be involved in the public participatory process for development of the air rights. Selection of the developers will likely be by the Commwonwealth with significant input from the City and local interests.

Continuing Development Planning

The joint development process would extend over the course of preliminary design, final design, construction, and into an implementation phase that would last as long as it takes to develop each of the new parcels - a minimum of 15 years from the commencement of project construction. The phasing of development planning activities is based on the timetable for design and construction of the project. The Preliminary Design Phase takes the project to the point at which design is 25 percent complete, and all major technical issues have been resolved. Detailed design and the working drawings can then be commenced. At preliminary design completion, plans for joint development must be sufficiently advanced such that all necessary provisions for the design of the tunnel and surface street system have been identified and approved. By this time, the process for agency and community participation must be well established; design guidelines, mechanisms for managing the development planning process, and for funding any necessary extra project costs must be determined.

The first phase of development ("short-term") would begin as soon as reasonable assurance of project approval and funding is received and continue to the start of preliminary design. The second phase ("mid-term") would begin with the preliminary design phase and end with the completion of preliminary design. The final phase ("long-term") would continue through the design phase until completion of construction and disposition of development parcels had occurred.

Short-Term Process

Between the publication of the FEIS/FEIR and commencement of preliminary design, the state will take steps to establish a responsive planning process. The "agenda" will include land use issues, minor refinements to surface street design, building scale, land disposition, job creation, public improvements and open spaces. The basic purpose of this stage will be to identify the full and specific range of issues to be addressed during preliminary design.

Community-based task forces will be established to provide for direct involvement in the planning as it affects specific subareas. The process will also include the participation of public agencies, organizations and individuals with relevant technical expertise in such areas as real estate development and finance, architecture and urban design, as well as community-based development. To accomplish this, strategic, task-oriented project-wide committees will be organized as necessary to address specific technical issues.

Because the Central Artery corridor passes through very distinct neighborhoods, historic districts and commercial areas, the issues and constituent groups vary by location. Accordingly, community-based task

forces will focus on geographic subareas. Membership will be open to all interested parties and the structure of the task forces will be formalized as the issues become more specific.

Workshops will be conducted in each of the subareas as part of the preliminary design phase. The product of these meetings will be joint development reports (issues papers) to guide the early phases of preliminary design. An understanding of community and agency concerns should precede detailed preliminary engineering in order for these concerns to be incorporated into the project design.

Mid-Term Process

This stage will be concurrent with the detailed design phase. The critical decisions regarding details of surface street design, open space, and design guidelines for development will be reached during this stage. Subarea task forces established to generate joint development issues papers will provide guidance for the design work of the various project design teams.

The proposed air-rights development scheme will be shaped in this period, and it is expected that numerous meetings, workshops, and other means of dialogue between the community, the city, the state, and the designers will occur. Interim products, including drawings, models and other illustrative devices will be prepared for task force review. The product of this work will be a set of joint development guidelines, a public improvements plan for each parcel, and a state policy plan for implementing the concepts developed by the process.

At the completion of preliminary design, specific products will include an overall land use plan for all parcels; a description of the mechanism for managing the ongoing process of development planning and developer selection; a description of the process for funding front-end structural and foundation costs; preliminary criteria for developer selection; and a plan for the development of proposed public open space. These would be linked to the final structural designs and the surface street system.

Long-Term Process

After the basic decisions regarding land uses and design guidelines have been made, there will be a continuing planning and implementation process to ensure that: (1) the detailed designs follow the decisions reached during the preliminary design phase; and (2) the selection of developers for air-rights parcels and the refinement of their proposed development plans are consistent with established design guidelines.

It is likely that the design guidelines for each parcel will be quite specific, reflecting the detail which emerges from the subarea task force review process. As the design guidelines and criteria for developer selection are finalized, advice will be sought from appropriate project advisory groups.

Financing and Development Mechanism

Providing a structural system for larger air-rights buildings will require a front-end investment which must be carried for 10 to 15 years. A state-backed development mechanism will be necessary to provide future development capability, assist in developer selection, finance some of the public open space improvements and enforce the subarea design guidelines. The specific development mechanism cannot be determined now but must be established at an early point in the overall process.

The mechanism ultimately selected must provide the availability of needed front-end public financing; be responsive to the plans produced through working with the subarea task forces; have direct access to key state and city policy makers; and be directly tied to the design process and thus able to assure that planning

fc the development parcels is fully ir egrated with the detailed design of th depressed roadway and of the su face street system.

The mechanism may combine e ments of more than one approach. So e of the specific problems likely to be encountered include: (1) to a ieve the desired land uses, build- i scale, and open space improvements o some parcels, it may be necessary t subsidize some portion of the cost w h revenues realized from the leases o other more profitable parcels; (2) s ne of the front-end costs, such as b sic alterations to slurry wall or t nnel box construction, are system- w de and not just related to a single p rcel or subarea; (3) the designated d velopers of individual parcels could b required to contribute to the c nstruction and maintenance costs of p blic open space improvements t roughout the corridor; and, (4) n n-traditional public and private f nding sources will probably be n eded to assist in financing open s ace and other public improvements.

Among the possible approaches a e: (1) establishing within the r sponsible state agency (EOTC and the D PW), the staff capability to execute ese responsibilities in conjunction th general or specific state bonding thority; (2) utilizing an existing ate agency with appropriate powers d experience (e.g., the Massachu- tts State Land Bank); and, (3) eating a special purpose public evelopment authority to oversee all evelopment planning and implementa- ion.

nterim Land Uses

During the two-year period equired for dismantling the Central rtery viaduct, new surface area will ecome available for other uses. The ew surface street system will be uilt in increments. Parcel avail- bility will parallel this effort, but he timing of new development will be function of market demand. Interim ses for these parcels, prior to development for buildings or public open space, could include surface parking, recreation, and temporary landscaping. Some parcels will probably be loamed, seeded and fenced until such time as permanent develop- ment is underway.

4.5 NEIGHBORHOOD AND COMMUNITY FACILITIES IMPACTS

4.5.1 Comparison of Alternatives

o South Boston will benefit from the Preferred Alternative through a reduction in truck and auto traffic on local streets. Removal of through trucks will improve the safety on local streets, and reduce traffic noise. Alternative 5A would reduce truck traffic on South Boston streets to a slightly lesser extent than the Preferred Alternative because it does not provide the same level of access as the Preferred Alternative. Alter- natives 2, 3, 3A, 4, and 5 would have minor positive impacts on South Boston traffic. The No-Build Alternative and Alternative 6 would not provide traffic benefits in South Boston.

o The Preferred Alternative will result in the Waterfront having a significantly improved quality of life following the removal of the elevated Central Artery, with aesthetic, air quality, noise and access benefits. Alternatives 3A, 5A and 6 will have similar benefits; the No-Build Alter- native and Alternatives 2, 3, 4 and 5 would not provide these benefits.

o The North End will have im- proved environmental quality following the construction of the Preferred Alternative. The long-term impacts on community cohesion are not based solely on the physical impacts of the project, but rather are also dependent on management of construction, and disposition of air-rights parcels. Alternatives 3A, 5A and 6 would have similar impacts. Alternatives 2, 3, 4 and 5 would provide only minor benefits to the community. With the No-Build Alternative, air quality and congestion caused by regional traffic

on local streets would continue to get worse over time.

o East Boston air quality will improve and traffic on most local streets will decrease with the construction of the Preferred Alternative. Alternatives 3, 3A, 5, and 5A would also cause these benefits, but would place the tunnel much closer to the community and would result in a permanent open space taking. No benefits would result from the No-Build Alternative or Alternative 6, and air quality and traffic would get worse over time. Alternatives 2 and 4 would have significant negative impacts on the East Boston community.

o Construction period impacts of the Preferred Alternative on the neighborhoods on the Boston side of the harbor are similar to those of Alternatives 3A, 5A and 6; and are of longer duration and more disruptive than those of the No-Build Alternative or Alternatives 3 and 5. The Preferred Alternative has the least construction period impact on East Boston, followed by Alternatives 3, 3A, 5, and 5A. Alternatives 2 and 4 are similar to Alternatives 3 and 5 on the Boston side of the harbor, but are significantly worse than all other alternatives in East Boston.

4.5.2 No-Build Alternative

South End

Long-term impacts are not expected with the No-Build Alternative.

Construction impacts may result from a small increase in traffic on local streets during portions of the three year construction period.

South Boston

Long term impacts will result from increased traffic on local streets. Heavy trucks will continue to find shortcuts through residential areas rather than staying on truck routes. This will further degrade the quality of life for residents.

Construction impacts may occu as a result of increased traffic diversions to local streets.

Chinatown/South Cove, Waterfront, North End, North Station, West End

Long-term impacts will not cause changes in existing or propos land use patterns and trends in the neighborhoods. Increased traffic congestion, air and noise pollution will reduce the quality of life for residents and visitors.

Construction impacts will inconvenience residents, shoppers, tourists for the three years during which redecking would occur. Acces from one side of the Artery to the other will become more difficult an inconvenient as residents and visit use alternative routes. This probl will be most acute for Waterfront a North End residents and visitors. temporary relocation of parking and pushcart storage from under the Art will affect residents and shoppers. Cross Street businesses will also b disrupted by noise and dust during construction.

East Boston

Long-term impacts in East Boston may result because the large proportion of elderly residents in East Boston, coupled with a rising vacancy rate (already higher than t Boston average), indicate that the area will experience considerable demographic change over the next 20 years. This makes the community sensitive to changes which affect neighborhood cohesion, as well as th character of the community.

With the No-Build Alternativ traffic increases in the existing tunnels, and Airport growth which i projected to occur as the regional a national economy continue to grow, will tend to increase traffic and related impacts in East Boston residential areas abutting the existing tunnels and the Airport. Noise leve related to traffic will increase, an

while air quality improvements due to federal emission controls are expected, pollutant concentrations will be near or above standards at several locations, reducing the quality of life in these areas and increasing the probability of disinvestment and associated community impacts. Land use conflicts between Airport-related and residential uses may also tend to impede neighborhood preservation efforts in localized areas.

Construction impacts will occur as a result of congestion resulting from redecking the Central Artery which will cause backups at the existing tunnel toll plaza. This will temporarily degrade local air quality.

5.3 The Preferred Alternative

Mitigating measures are briefly discussed below; for greater detail see Section 4.4 LAND USE IMPACTS where neighborhood related mitigating measures are spelled out.

South End

Long-term impacts on the South End neighborhood will be positive. Minor decreases in through traffic on South End streets, as a result of the Herald Street Extension and Expressway ramp relocations, are expected to improve the quality of life on residential streets.

Construction impacts of the Preferred Alternative will have little effect on community facilities and neighborhood cohesion in the South End.

South Boston

Long-term impacts of the Preferred Alternative will be positive for South Boston neighborhoods. The Preferred Alternative will remove through truck and commuter traffic from South Boston's streets. In particular, traffic on A and D Streets and on Day Boulevard will decrease.

Pedestrian access between South Boston and downtown will be significantly improved with the construction of a continuous walkway from Broadway to Summer and Congress Streets along Fort Point Channel.

Construction impacts are expected to be relatively minor. A new West Fourth Street Bridge will be built as a separate project prior to the commencement of the Central Artery/Third Harbor Tunnel project. The Broadway Bridge will remain open while Herald Street Extension is being built. Therefore, access to the residential community will not be reduced during the construction period.

During construction of the depressed Central Artery, the increased congestion on downtown Boston surface streets may increase diversions of through traffic into the community to a minor extent.

Mitigating measures include traffic management and construction staging to minimize detours, and to prevent through traffic from detouring to residential streets. The new Herald Street Extension will be completed prior to the closing of the Broadway Bridge so that residents will always have access to Expressways and other parts of Boston.

Chinatown/South Cove

Long-term impacts will be positive as a result of decreased traffic on Kneeland Street and the removal of through traffic from Beach Street. The project is compatible with the proposed Dewey Square TSM project which will precede the Central Artery/Third Harbor Tunnel project. The TSM project will close the three northbound lanes of the Surface Artery and shift southbound traffic to those lanes, thus providing the opportunity to construct open space areas adjacent to the Chinese community and to create an appropriate setting for the Chinatown Gate area.

Pagoda Park, an open space area near Chinatown consisting of two basketball courts and a volleyball court, had been leased on a short-term basis by the Boston Parks and Recre-

ation Department from the Massachusetts Turnpike Authority. The site is currently under lease to the Wang Corporation. The site of this park will be displaced by the project (FHWA has determined that Section 4(f) requirements do not apply to Pagoda Park -- see COMMENTS AND COORDINATION). These facilities will be provided on a site made possible by the separate TSM project noted above, in the vicinity of the Chinatown Gate.

Construction impacts in this area will be caused by increased traffic on Kneeland Street. Actual construction activities in the immediate vicinity of the community will not be significant.

Mitigating measures will include traffic management techniques to minimize disruption during the construction period. Beach Street will be prevented from being used as a detour route.

Waterfront

Long-term impacts are primarily positive. Removal of the Central Artery structure will improve the pedestrian environment and reduce traffic-related air and noise pollution. The "Walk-to-the-Sea" will be greatly enhanced. Pedestrians walking along the waterfront on Atlantic Avenue will have views of their destinations. Pedestrian access between various Waterfront attractions, as well as between the Waterfront and surrounding neighborhoods, will be improved as traffic on Atlantic Avenue is reduced.

Parking spaces both under and alongside the existing Central Artery that are taken by the project will be replaced. Tour bus parking will continue to be provided on local streets.

Construction impacts, including dust, noise, vibration and congestion, will reduce the quality of the pedestrian environment, and will be disruptive for area residents and tourist
Noise, dust and traffic management mitigating measures will reduce the impacts. Increased traffic on Atla tic Avenue and Commercial Street wi impair access to public facilities such as Christopher Columbus Park, New England Aquarium and the Aquar MBTA station. It will be more diff cult for residents of the east side Atlantic Avenue, and for tourists visiting waterfront attractions, to get to surrounding areas. Atlantic Avenue will be rebuilt by the Massa chusetts Department of Public Works make it safer, prior to the start c this project. Pedestrian access wi be assured at all times during construction. As detailed in the land use section, the open-air Haymarket pushcart area, a community facility which depends on pedestrian access, will be affected by the constructio specific noise and dust control measures will be undertaken.

The ventilation building in vicinity of the Harbor Towers will affect air quality in that area. Further air quality modeling and analysis of the ventilation system will be performed to assure conform ance with appropriate air quality standards and to minimize air quali impacts on neighborhood residents.

Mitigating measures specific the Waterfront include provisions f ensuring Haymarket's operations (se Section 4.4.3 Waterfront) and provi sion of designated areas for the unloading and parking of tour buses local streets.

Government Center

Long-term impacts will resul in more circuitous access to the ar from the Central Artery. The elimi tion of the southbound Central Arte exit ramp at New Chardon Street wil require drivers coming from the nor to use the Causeway Street exit ram and follow surface streets into the Government Center area. Drivers coming from the south will exit at North Street and make a U-turn onto

Clinton Street or continue on the Surface Artery to New Chardon Street.

The environment will be improved for pedestrians moving between the neighborhoods across the Artery corridor.

Construction impacts will be related to access. Confusion resulting from the relocation of access points and streets will be a problem for the many visitors to Government Center who are only slightly familiar with the area. Changes in street and traffic patterns will also inconvenience the MBTA and commuter buses coming in and out of Haymarket Station. Construction related noise and dust will inconvenience the large number of pedestrians in the area.

Mitigating measures include traffic management techniques to ensure pedestrian and vehicular access to the Haymarket MBTA station, particularly across the construction corridor from the North End. Parking which is lost from lots under the elevated Central Artery will be replaced nearby.

North End

Long-term impacts include both actual physical changes and the perception by residents that the neighborhood has changed.

Removing the existing Central Artery structure will improve the western edge of the North End aesthetically. Pedestrian routes between the North End and other downtown neighborhoods will be more open and attractive. Convenient access between the North End and the Haymarket MBTA station will be provided.

Predicting the ultimate impact of the physical and perceptual benefits of removing the Central Artery on the social fabric of the North End is very difficult. For a number of years, new private development and public improvements in the adjacent Waterfront area have been attracting new residents to the North End community, with resulting increases in housing costs and condominium conversions. A growing proportion of North End housing is less affordable to long-term North End residents. Development pressures on the North End are expected to continue in this direction independent of this project. Over the next decade, unless active policy intervention is undertaken by the City, these changes can be expected to continue and accelerate. The prospect of improved overall neighborhood conditions due to elimination of the viaduct may reinforce this trend. Conversely, commencement of a relatively extended construction period may dampen real estate speculation and pressures on the North End housing market. At the conclusion of construction of the Artery depression, the improved environmental quality of the area may encourage existing residents to stay, help to strengthen the neighborhood economy, and, therefore, reinforce the existing community.

Business at North End restaurants and stores could improve as visitors to surrounding neighborhoods find it easier to walk into the North End. These businesses are an integral component of the community's ethnic cohesiveness. A depressed Central Artery and new cross-harbor tunnel will reduce traffic-related air and noise pollution in the area. All parking spaces which are displaced by the project will be replaced nearby so that lack of parking does not discourage visitors and shoppers.

A key variable affecting the direction of the North End community in this regard will be the actions of state and city government. Programs to assist long-term residents to continue to own or rent housing in the North End, condominium conversion and rent controls, public improvements targeted to the needs of existing residents, and parking and development controls, generally, are types of measures which would tend to stabilize the community.

The State, in cooperation with the city, will ensure the adherence to

sensitive development controls for adjacent air-rights joint development, and the participation by neighborhood residents in the planning process for such joint development. This will promote future joint development uses that are compatible with the North End neighborhood.

Construction impacts will be substantial for the entire construction period. A large number of residences, restaurants and food shops are located very close to the construction area, and will be particularly affected by construction period noise, vibration and dust. Open-air produce markets on Cross Street are particularly sensitive, and any loss in sales may be difficult for them to absorb. Local residents are dependent on these shops and have few neighborhood shopping alternatives. The State will sponsor programs for the maintenance of local businesses during construction, and will carry out measures to mitigate noise, dust and vibration impacts.

Street closings and traffic detours may exacerbate existing circulation and congestion problems. Access to other parts of the city will be impaired. Delays and less convenient bus service at Haymarket will pose a hardship for transit-dependent North End residents. Traffic detouring via Commercial Street, to avoid the construction zone, will make it more difficult for neighborhood children to cross to the two large waterfront recreation areas. Traffic management programs to mitigate these impacts will be undertaken for the duration of the construction period.

A ventilation building will be located in the North End area which may affect air quality in the neighborhood. Further air quality modeling and analysis will be performed to determine the final location and configuration of the building to assure conformance with air quality standards and to minimize air quality impacts on neighborhood residents.

Mitigating measures in the North End include measures to reduc noise, dust, vibration, parking, traffic and other impacts. See Section 4.4 LAND USE IMPACTS for a complete description of these mitig- ing measures.

North Station

Long-term impacts on communi facilities in this area will occur because access to existing faciliti such as the Boston Garden will be affected. Access from the north wi be improved; however, access from t south will be more circuitous. Bos Garden's office and service facilit in the Anelex Building will be take by the project, but replacement facilities will be provided, if a n Arena is not built in the interim.

Construction impacts include loss of parking spaces, and difficu pedestrian access during some stage of construction.

Mitigating measures include traffic management to facilitate pedestrian access across Causeway Street and replacement of Boston Garden support facilities.

West End

Long-term impacts will be minor. A smoother flow of traffic through Leverett Circle will improv air quality and reduce traffic-rela noise at Charles River Park.

Construction impacts will result from the construction of the tunnel leading into Storrow Drive. Traffic congestion will increase as the connection from Storrow Drive t Interstate Route 93 is temporarily closed and traffic has to divert to other streets. Increased traffic i this area may impair access to Mass- chusetts General Hospital, the Spaul- ing Rehabilitation Hospital and the Massachusetts Eye and Ear Infirmary from the north for approximately 12 months. During a three-month construction period, noise and dust wi be annoying to people using Charles bank Playground. (See Section 5.1.

Charles River Basin Reservation for a detailed description of the impacts on this Park.)

Mitigating measures include traffic management techniques to ensure that emergency access to the hospitals is maintained at all times. Noise and dust control measures will be implemented in the area of the Charlesbank Playground.

East Boston

Long-term impacts will be beneficial to the community. Reduced congestion, improved air quality and convenient access to downtown will improve the overall quality of life for most East Boston residents.

There will be reduced traffic levels at the Callahan/Sumner Tunnel toll plaza, reduced traffic on part of Bennington Street, and on Bremen, Chelsea, and Porter Streets; and improvements of traffic flows at Logan Airport and along Route 1A. The provision of direct bus ramps connecting the new tunnel to South Station is intended to divert riders from automobiles to mass transit and therefore reduce the impacts on East Boston of Airport-related traffic.

The ventilation building for the Third Harbor Tunnel will be located at Bird Island Flats, and is far enough away from the community that no local changes in the environment will be perceptible. Air quality will improve over a broad area as a result of the project.

Relative to the No-Build Alternative, the Preferred Alternative will reduce through traffic on local streets and result in less Airport related traffic intrusion into the neighborhood.

As noted in Section 5.1.1, improvements to the access from Porter Street to the East Boston Memorial Stadium will be included in the project. The access improvements, as well as increasing the size of the park and shielding the southern end of the park from noise, will enhance this important community facility.

Construction impacts will be insignificant as construction will not occur near residential areas. Construction activities will be more than 500 feet from residential areas; the existing noise barriers will help to reduce impacts. The tunnel through Bird Island Flats will be built using slurry wall construction methods, thus reducing construction noise.

East Boston Memorial Stadium will be affected during construction, with the use of the tennis courts and a portion of the parking lot disrupted for three to six months. (See Section 5.1.1 for a detailed description of impacts on this park.)

Mitigating measures in East Boston include restrictions of heavy construction equipment from local streets, particularly for removal of excavated materials.

Several parcels of land will be created adjacent to the Stadium; these parcels will be used to create visual and noise barriers between Airport roadways and the Stadium; this will result in an improved public open space.

4.6 ECONOMIC IMPACTS

Approach to the Analysis

The assessment of economic impacts is based on current and projected future economic conditions throughout the project area and Greater Boston Region (SMSA), and on changes in transportation service and accessibility attributable to each alternative, during and after construction. Major economic issues thus include the following:

1. Impacts on the regional economy, which is affected significantly by through-trips on the Central Artery and by access to Logan Airport (Section 4.6.2);

2. Impacts on the project area economy - roughly, the Boston Central Business District, including the North End, northern industrial district of South Boston, Faneuil Hall/Waterfront, West End/Government Center, Eastern Retail Core/Downtown Crossing, the Chinatown/Leather District, the South End and East Boston, which is principally affected by access to and from the highway system and local streets (Section 4.6.3);

3. Impacts on economic activities within specific subareas (noted above), which are primarily affected by truck and auto movements on local streets, as well as access to and from the highway system (Section 4.6.4).

Other categories of major economic impact addressed in this section include development and related fiscal impacts (Section 4.6.5), and the impacts of construction expenditures on regional sales, household earnings and jobs (Section 4.6.6). Measures to mitigate anticipated adverse effects are highlighted in Section 4.6.7.

In the course of this analysis, over 160 public and private sector officials from each major economic sector were contacted. Ninety-two (92) personal and telephone interviews were completed with officials representing 88,000 employees, or 43 percent of total study area employment. Freight forwarders and major users of air freight located outside the immediate study area were also contacted. The results of these interviews, along with the relevant traffic and economic data, served as a basis for the following analysis.

4.6.1 Comparison of Alternatives

o The Preferred Alternative and Alternative 5A would provide a $20-$30 million one-time receipt (not annual) in city property tax revenues due to faster absorption of space in new South Boston developments. The comparable one-time impacts on local property taxes with Alternatives 2, 3, 3A, 4 and 5 are estimated at $2 to 5 million and at $1 to $3 million wi[th] Alternative 6. The No-Build Alternative will not create added local property tax revenues over the lon[g] run.

o The Preferred Alternative w[ill] change land use in downtown Boston [by] adding approximately 20 new acres [to] the existing stock of land. The estimated construction costs for t[he] development of buildings on this l[and] are approximately $285 million in [] dollars. This would generate 6,10[0] person-years of on-site constructi[on] employment. Total direct, indirec[t] and induced impacts of these construction expenditures on the regional economy would include an estimated $960 million in industry sales and household earnings, and 10,800 person-years of employment. Full development of this land will also result in a $6 to $11 million annua[l] property tax increase to the City o[f] Boston. Alternatives 3A, 5A and 6 would have a similar impact on the local and regional economy. Alternatives 2, 3, 4, 5 and the No-Build Alternative would not result in th[e] creation of this land and would therefore not have this impact on area economy.

o During the construction per[iod] the Preferred Alternative and Alternatives 5A and 3A are expected to be less disruptive to the regional economy than Alternative 6, becaus[e] they produce the additional cross-harbor capacity earlier during the construction period, and because existing cross-harbor access will [be] maintained prior to that time. Alternatives 2, 3, 4 and 5 will cau[se] relatively minor disruption to the regional and project area economy. The No-Build Alternative will caus[e] the most short-term disruption to t[he] regional economy during its three [year] construction period.

Local access and related economic impacts, on the other han[d] are less disruptive for the No-Buil[d] Alternative due to the shorter overall construction period.

o During the construction period, the Preferred Alternative and Alternatives 3A, 5A, 6 and the No-Build Alternative will result in retail sales losses of 2.6 to 5.0 percent in the project area annually during construction. Alternative 6 is expected to be more disruptive to retail sales because it lacks the cross-harbor traffic diversion potential of either the Preferred Alternative, Alternatives 5A or 3A. Alternatives 2, 3, 4, and 5 will not significantly affect retail sales in the project area economy during construction.

Regional economic impacts for construction expenditures are shown in Table 46, with the Preferred Alternative yielding approximately $4.3 billion in direct and indirect industry sales.

The Preferred Alternative, and Alternatives 3A and 5A will result in significant improvements in time-sensitive access to Logan Airport and can be expected to have a long-term beneficial effect on regional goods movement, and a positive influence on business investment decisions (and employment) throughout the region. Alternatives 2, 3, 4 and 5 will result in improvements in access to Logan Airport, but to a lesser degree than for the above mentioned alternatives. Without the additional cross-harbor capacity, traffic service to Logan Airport with Alternative 6 and the No-Build Alternative can be expected to deteriorate over the long-term, with a potentially unfavorable impact on regional industries requiring time-sensitive access to Logan, including high technology industries.

o The Preferred Alternative, and Alternatives 5A and 3A will, over the long run, provide benefits greater than those under Alternatives 2, 3, 4, 5 and 6, because they provide an improved Central Artery in addition to a Third Harbor Tunnel. Completion of the No-Build Alternative does not provide any comparable long-term benefits. Based on traffic projections for 2010, failure to improve Central Artery traffic flow and access to Logan Airport will result in increased travel times and costs for regional movements to and through the project area. This could exert a long-term dampening influence on regional business investment (and employment) prospects.

4.6.2 Impacts on the Regional Economy

Long-Term Impacts

The Preferred Alternative will have beneficial impacts on the regional economy because it will provide better regional traffic service to Logan Airport, and for through traffic using the Central Artery.

The beneficial impacts of better regional traffic service extend to a variety of economic user groups, including trucks engaged in essential commercial activities (8 to 14 percent of total vehicles on the regional network); employees; retail shoppers; and consumers of leisure, cultural, and entertainment resources. The No-Build Alternative will not improve regional traffic movements to and/or through the study area over the long-term.

Growth of high technology industries in particular over the past ten years has significantly increased the importance of time-sensitive access to Logan for regional economic performance. Anticipated high-technology industrial growth in southeastern Massachusetts and northern Rhode Island also makes Central Artery accessibility to the south and west particularly important.

Traffic service to Logan Airport is expected to deteriorate over the long-term under the No-Build Alternative and to improve with the Preferred Alternative. Significant improvements in time-sensitive access to Logan from completion of the Preferred Alternative can be expected to have a long-term beneficial effect on regional goods movement, and can

positively influence business investment and employment throughout the region.

Access between the Boston Central Business District, where the regional financial industry is concentrated, and other parts of the metropolitan region, is heavily dependent upon the functioning of the Central Artery. Access to Logan Airport is particularly important to the financial industry and to certain service industries, as well as to the freight and parcel delivery firms which serve them. Included in these categories are bank check clearing functions (the earnings on which are highly sensitive to delivery times in and out of Logan), emergency hospital services, and small parcel shipments to and from a variety of business or personal service companies. These industries, as well as the manufacturing firms located to the south and west of the CBD, rely upon the availability of direct highway access to Logan Airport, and could be expected to experience travel time (and cost) benefits with the Preferred Alternative.

Aggregate travel time savings are estimated at 17.6 million person hours per year for the Preferred Alternative. These potential savings in travel time reflect improved accessibility for firms and employees to the regional employment base and to major market areas within and beyond the region.

The No-Build Alternative does not provide any comparable long-term benefits. Based on traffic projections for 2010, failure to improve Central Artery capacity and access to Logan Airport will result in increased travel times and costs for regional movements to and through the project area. This could exert a long-term dampening influence on regional business investment (and employment) prospects.

Regional Economic Impacts from Construction Expenditures

Construction expenditures from the Preferred Alternative will gen- erate significant industry sales, household earnings, and jobs throu- out the regional economy. Impacts include the direct effects of construction labor and material purchases, plus the indirect and indu (or multiplier) effects of off-sit material and labor inputs to these purchases. Table 46 estimates the impacts. Overall, the Preferred Alternative will generate an estim $4.3 billion in industry sales and household earnings and approximate 77,000 person-years of employment. The No-Build Alternative will have estimated $65 million direct, indirect, and induced industry sales household earnings, and 1,100 pers- years of employment. Net increase State income tax receipts from agg- gate construction impacts with the Preferred Alternative would be expected to total approximately $80 million more than the No-Build Alt- native.

Assuming that construction labor requirements are fairly even distributed over the 12-year perio these requirements are not expecte significantly affect region-wide construction labor availability in single year. Approximately 25 per of these jobs are expected to be h by City of Boston residents.

Construction Period Impacts

From the regional economy standpoint and for the reasons not above, the construction period's m significant impact is on access to from Logan Airport, particularly a freight movements of certain manuf- tured and other products.

The Preferred Alternative w add four traffic lanes of capacity Logan Airport four years after construction commences. This will div south and west originating trips t Logan (15 to 20 percent of all traf fic) from the Central Artery. The No-Build Alternative will have a negative impact on regional person goods movements during the four yea that Central Artery capacity and service are constrained, and impact

Table 46

DIRECT AND INDIRECT IMPACTS OF CONSTRUCTION EXPENDITURES ON THE REGIONAL ECONOMY

	ALTERNATIVE								
	1	2	3	3A	4	5	5A	PREFERRED	6
Expenditures/Construction Costs (in millions of 1983 dollars)	$ 32.5	$ 749	$ 945	$ 1,835	$ 735	$ 927	$ 2,136	$ 2,600	$ 1,275
On-Site Construction Jobs (in person years)	697	16,073	20,279	39,378	15,773	19,893	45,815	55,794	27,360
TOTAL DIRECT, INDIRECT AND INDUCED REGIONAL IMPACTS									
Industry Sales and Household Earnings (in millions of 1983 dollars)	$64.7	$ 1,236	$ 1,559	$ 3,028	$ 1,213	$ 1,530	$ 3,523	$ 4,290	$ 2,104
Total On-Site and Site Jobs (in person years)	1,104	22,227	28,044	54,455	21,812	27,510	63,357	77,000	37,836

are also expected to be more severe over this period for through-trip movements.

Certain industries, such as freight and parcel delivery establishments, emergency hospital delivery services, and time-sensitive businesses will experience travel time and cost increases during limited construction phases of either the Preferred or the No-Build Alternative.

4.6.3 Impacts on the Project Area Economy

Long-Term Impacts

The Preferred Alternative will improve both north-south (Central Artery) and east-west (cross-harbor) access by removing existing bottlenecks and increasing capacity. It will also enhance accessibility to and within downtown Boston, with significant traffic service improvements expected in general, on the downtown streets.

Such improvements in downtown access would be expected to produce general long-term benefits to the study area economy, including travel time (and cost) savings for both person trips and goods movements and reduced congestion which will improve auto-dependent retail sales. Such improvements may also enhance the climate for expanded investment (and employment) in each major economic sector. The No-Build Alternative provides no comparable long-term benefits to the study area economy.

Construction Period Impacts

Retail sales, goods movement, attendance at leisure-oriented facilities, and time-sensitive deliveries of public and private services within the CBD study area will be negatively affected during construction of the Preferred Alternative. However, the degree of disruption varies by economic sector and by location within downtown. The No-Build Alternative will also affect the above industries, although the extent of disruption is lessened by a shorter construction period.

The transportation industry within downtown, including freight forwarders, courier and other parce services, is expected to incur increased labor costs due to travel delays, and possible capital costs cumulative delays may force additio equipment purchases to assure relia service.

The leisure and recreation industry, including museums, the Aquarium, movie theaters, and other cultural facilities, is expected to experience some attendance and reve declines during construction. Impa are primarily subarea specific, and will be limited to those periods during construction when physical access and/or parking is temporaril disrupted or lost in the immediate vicinity of the facility. Construction staging and techniques will ke such disruptions to a minimum.

Employee commuting by auto w be disrupted, but, with a few subar exceptions, most employers expect further diversions to mass transit peak hour spreading, and therefore negligible impact on employee acces

Construction activities are expected to dampen retail sales to shoppers, other than downtown emplo ees arriving in the study area by auto. Auto-dependent trips compris approximately 10 to 15 percent of (retail shoppers; auto-dependent ret sales throughout the study area are estimated to total approximately $2 million annually (including Lafayet Place, scheduled for completion in summer of 1984), or approximately 2 percent of the $835 million estimat study area retail sales overall.

Retailers are concerned with actual physical disruption in patte of access and travel times, as well with the "perception" of difficulti by prospective customers, particula in the case of comparison goods shopping (75 percent of all downtow retail sales). Retail sales losses

during construction in the project area were forecast in a range from 2.6 to 5 percent of total study area retail sales (an annual total of $23 million to $45 million in constant 1982 dollars, or 10 to 20 percent of auto-dependent shopper sales). The Preferred Alternative, in which the new Third Harbor Tunnel is completed in Year 4, prior to the reconstruction of the approaches to the existing tunnels, and which includes a Surface Artery/Atlantic Avenue six-lane roadway in operation throughout the construction period, is expected to limit retail sales losses to the lower end of this range. Completion of Red Line and Orange Line extensions is expected to offset this loss in part by drawing additional suburban shoppers to downtown.

4.6.4 Impacts on Subarea Economics

Long-Term Impacts

With the Preferred Alternative, traffic circulation patterns to Downtown Crossing retailers from the south and west will not be altered over the long-term, and traffic service is expected to improve compared to the No-Build Alternative. Access from the south and west to the Faneuil Hall/Waterfront area, and to the concentration of retailers located there, is expected to improve significantly over the long-term with the Preferred Alternative. The provision of a continuous Surface Artery above the depressed Artery is expected to improve local distribution of traffic.

Between Faneuil Hall Marketplace and the Waterfront, the Preferred Alternative will improve visual and physical linkage. The overall improved appearance of the Faneuil Hall/Waterfront subarea should attract more people to the area for both leisure and shopping. The waterfront retail establishments, restaurants, and hotels will benefit from increased customer spillover from Faneuil Hall when the Central Artery elevated structure is removed.

Wholesaling and manufacturing will also benefit from improved access to the Airport and to the north by the Preferred Alternative. Travel times will decrease and wholesalers' customer bases will increase slightly due to improved access to and from South Boston.

Improved access to South Boston from the Preferred Alternative, coupled with improved access to the Airport and points north, will make the industrial portion of South Boston a more desirable location for manufacturing industries. Land values and prices will increase, possibly forcing a number of low-rent manufacturing tenants to leave.

Increased access to the South End from the north and east in the Preferred Alternative will only marginally improve the business climate in this area. Land values in the South End will not be significantly affected.

In East Boston, the increased Airport access of the Preferred Alternative will enhance Airport economic activities. Economic activities within the residential community are expected to improve marginally.

Construction Period Impacts

Downtown Crossing

To and from the south and west, traffic to the retail core should not be significantly affected during the entire period of construction. Construction in the Dewey Square area is focused on the Fort Point Channel, and not along certain city streets used to get to the retail core such as the Surface Artery south of Summer Street and Lincoln Street. The impact on economic activity in Downtown Crossing therefore, will be minimized.

To and from the north and northeast, traffic is expected to use the existing Central Artery, which will be maintained at six lanes during the construction period. During the final phases of new, depressed ramp construction, both the existing

Central Artery and the six new lanes of the depressed artery (open to through traffic) will be in operation. Traffic which uses the Surface Artery from High Street to North Street to reach the retail core will be negatively affected by construction. Although retail sales losses in the project area are expected to range from 2.6 to 5 percent, these losses would occur due to a reduction in auto-dependent shoppers. The majority of shoppers in the downtown core arrive by transit and will not have their shopping patterns affected by construction activities.

Faneuil Hall/Waterfront

During the construction of a depressed Central Artery, access to Faneuil Hall will be constrained. During most of the construction period, the Surface Artery and Atlantic Avenue combined will provide six lanes, in comparison to the present eight lanes. This will affect access to the Faneuil Hall area for those motorists coming from the south and west. The construction haul road will provide construction vehicle roadway service in the area; however, construction related delays can be expected. To and from the north, Faneuil Hall bound traffic would use the existing North Street on- and off-ramps, which will remain in service throughout most of the construction period.

The disruption of traffic is significant to Faneuil Hall merchants because a majority of their patrons arrive by auto. The combination of traffic disruption and loss of parking under the Central Artery is estimated to result in a loss of approximately 10 percent of potential sales at Faneuil Hall Market Place, or $8 million annually during construction. (This amount is included in the total expected losses noted above for the project area as a whole.) The provision of replacement parking for parking spaces lost during construction of the project will reduce this impact to some extent, depending on the exact location for this replac ment parking.

Patronage of Waterfront res rants is directly dependent on a variety of pedestrian links from t Financial District to the Waterfro Mitigating measures will ensure th maintenance of pedestrian access across the construction corridor.

South Boston

Development of a traffic management plan to assure access t the area will be essential to mini potential economic impacts on the local economy. Because the plan w be incorporated into the project, is expected that economic impacts the businesses in the area will no significant.

In the northern part of Sou Boston, restaurant patronage is hi dependent on access by car. At various times during construction, customer access may be somewhat constrained while tunnel construct proceeds in the Fort Point Channel area. Customer access to South Bo wholesalers will also be affected during these periods, although app priate detours will allow continue access.

South Boston has a large concentration of Boston's food pro cessors, an industry with a high percentage of time-sensitive shipments. In particular, the seafood industry is heavily dependent on access to and from Logan Airport. Longer travel times to Logan would increase costs to meet pick up and delivery schedules and would resul loss of business if customer order could not be met on time. The sea industry is also heavily dependent truck shipments via the Central Artery. Since the Third Harbor Tu will be constructed early during t 12-year construction period, and traffic management plans will be developed to maintain access and traffic flow in the area, it is expected that these potential impa

will be minimal.

Forty-seven percent of all downtown printing establishments are located in South Boston. Approximately 10 percent of this industry's local deliveries are extremely time-sensitive. Access to the South Boston area will be maintained during construction although delays due to detours and construction activities may affect sales in the area. Again, the economic impact on these businesses will be minimized by appropriate traffic management plans.

North End

A high percentage of North End restaurant and food store patrons arrive by car, many after the evening rush hour. Parking is presently difficult in the North End. In order to prevent it from getting any worse during construction, replacement parking will be provided prior to construction in convenient locations (see Section 4.4. LAND USE IMPACTS). This subarea may experience decline in retail sales because of the construction activities, particularly in the area immediately adjacent to the project construction. Special provisions will be included in the construction documents to assure continued pedestrian access across the construction site to the North End.

hinatown/Leather District

The Chinatown/Leather District ubarea has a high concentration of cientific and related instruments anufacturing. Approximately 40 ercent of this industry's shipments o to Logan Airport. Although nearly ll of these shipments are during ff-peak hours, increased travel times o Logan during construction would ncrease costs.

South End

Increased traffic on Albany Street between Herald and East Berkeley Streets during construction is expected to have only a marginal impact on business activities in the South End.

East Boston

Construction impacts in East Boston will largely be localized at Logan Airport and are thus not expected to affect overall East Boston business activities.

4.6.5 Development and Related Fiscal Impacts

Long-Term Regional Development Impacts

The Preferred Alternative is expected to provide positive stimulus to the overall project area due to the superior access that it affords South Boston (north). In East Boston, the Massachusetts Technology Center should benefit from the tunnel over the long term, with the maintenance of clear access provided to the property. The No-Build Alternative may have a long-term negative impact on development activities due to lack of overall traffic service improvements and increased congestion.

A major long-term net benefit from the Preferred Alternative will be the creation of roughly 2.75 million square feet of air-rights development opportunities, not including parking and open space. Based on estimates of office, commercial, residential and parking land use, construction costs for the full air-rights program are estimated to total approximately $285 million (1983 dollars) and would generate 6,100 person-years of on-site construction employment. Total direct, indirect, and induced impacts of these construction expenditures on the regional economy would include an estimated $960 million in industry sales and household earnings, and 10,800 person-years of employment. Long-term jobs attributable to the office, commercial and residential land uses assumed for the full air rights program are estimated to total 9,400. These workers (and new residents) would be expected to generate an estimated $9 to $10 million annual retail sales within the project area.

The introduction of direct access between South Boston and the Massachusetts Turnpike, the Southeast

Expressway, and Logan Airport is expected to accelerate development in the seaport area of South Boston. The facilities provided by the Preferred Alternative are likely to increase land values in the seaport area, and to be of particular importance to industries which will benefit from improved Airport access.

Long-term impacts of the Preferred Alternative on local property taxes are estimated to include:

o A $5 to $10 million annual property tax benefit after full absorption of 2.75 million square feet of potential new air rights development that will become available over the Central Artery with the Preferred Alternative (over time, additional city property tax revenues could be realized as a result of general improvements in the project area environment); and

o a $20 to $30 million one-time receipt (not annual) because of faster absorption of space in new South Boston developments due to the Preferred Alternative.

As discussed in Section 4.4, a variety of areas where traffic service has been most seriously affected by delays on the Central Artery, including suburbs close to Boston (e.g., Quincy, Milton, Somerville, Chelsea and Revere), may experience some increase in development and related economic growth due to improved access to and through Boston with the Preferred Alternative.

4.6.6 Construction Period Impacts on Development

During the construction period, neither alternative, Preferred or No-Build, is assumed to affect development activities on a regional scale, but rather will influence regional development activities indirectly through the location, timing and pace of development within the study area.

The Preferred Alternative will affect the marketability of development projects in the immediate construction vicinity that are due to completed during 1986-1991. New projects not located in the immedi construction area should only be marginally affected. After 1991, negative impacts on Boston area development due to construction of Preferred Alternative will diminis almost entirely, due to the openin the Third Harbor Tunnel and the partial reopening of the Surface Artery.

Major construction period impacts will be concentrated in th Financial District/Waterfront (ZIP 02110) and the South Boston-North 02210) subareas. In the Financial District/Waterfront subarea, Rowes Fosters Wharf and the Fort Hill ar projects will have recently been completed just before major construction under the Central Art is beginning. With the Preferred Alternative, both projects may experience added development complexities, and space may be mor difficult to market due to the dir effects of construction activity. No-Build Alternative will have les overall impact on development, but will disrupt selected developments within the immediate vicinity of construction to some extent. Construction activities of the Prefer Alternative could delay full leasi of these projects somewhat, but wi not prevent their development.

In South Boston (north), initial construction disruption fr the Preferred Alternative would be expected to slow down absorption o space in commercial, industrial, a residential properties that would opening in the 1987-1990 construct period. During this time, South Boston will experience some loss o access (both locally and regionall and it will become somewhat more isolated from downtown. The Prefe Alternative will have created a ne benefit to South Boston by the yea 1995. The No-Build Alternative sh have little or no construction peri impact on development in northern South Boston.

In East Boston, the Massachusetts Technology Center requires protection against potential noise and vibration impacts during construction to permit the full tenant absorption in Phases II and III of this development, and to avoid a negative impact on overall leasehold and financing arrangements. Access roads not used by tunnel-related construction vehicles will be required (see Section 4.4. LAND USE IMPACTS).

Construction period fiscal impacts could include short-term losses in city property tax revenues due to delays in development absorption. For example, the potential delay of up to 1 - 1-1/2 years in developing Rowe's and Foster's Wharf and the Fort Hill area with the Preferred Alternative could result in a one-time $5 million tax loss.

4.6.7 Measures to Minimize Adverse Effects

Section 4.4.3 includes a full description of mitigating measures which are relevant to the impacts discussed in this section. Among those measures, the items noted below are exceptionally important to mitigating economic impacts.

Impacts on the Boston CBD Economy

For both the Preferred Alternative and No-Build Alternative, use of print, TV and radio media and highly visible signage to avoid confusion resulting from detours and temporary ramp closings, and redirect traffic away from bottlenecks and sensitive residential areas will be important.

Impacts on the Project Area Subarea Economies

Retail - Provide for the replacement of parking spaces lost underneath the Central Artery to mitigate adverse impact on Faneuil Hall Marketplace, North End and North Station area retailing. Minimize traffic detours and potential ramp closings on streets providing access to Faneuil Hall Marketplace and Downtown Crossing.

Waterfront Land Uses - Maintain pedestrian thoroughfares underneath the elevated Central Artery.

Manufacturing and Wholesaling - Maintain access to surface roads and bridges (particularly to South Boston); provide advance publicity of any necessary street closings, together with suggested alternative routes; and restrict closings of important surface roadways to non-working hours.

Fiscal and Development Impacts - Minimize construction noise and staging activities as well as disruptions in service road access adjacent to any proposed developments in the immediate vicinity of the construction area. Avoid major losses in access due to detours and/or ramp closings, particularly in the 1987-1991 construction period.

4.7 AIR QUALITY

The air quality consequences of the Preferred Alternative are presented in terms of their total emissions burden (mesoscale analysis), maximum one and eight-hour carbon monoxide (CO) concentrations (microscale analysis), effects of toll plaza emissions and concentrations in the tunnels, effects of ventilation building emissions, and impacts during construction. Where potential adverse impacts are identified, potential mitigating measures to alleviate these impacts are described in each of these impact categories. Within each impact category, a summary comparison of all alternatives considered in the EIS/EIR is presented, followed by a detailed assessment of the Preferred Alternative relative to the No-Build Alternative.

4.7.1 Mesoscale Analysis

General

This project is in an air quality nonattainment area for which transportation control measures are included in the State Implementation

Table 47

TOTAL 24-HOUR EMISSIONS OF CARBON MONOXIDE, OXIDES OF NITROGEN, AND NONMETHANE HYDROCARBONS

Analysis Year	Alternative	Pollutants (kg/day) NMHC	CO	NO_x
1982	Existing	4,230	60,200	6,520
1990	No-Build	1,810	39,500	4,610
	Preferred	1,870	41,400	5,250
2010	No-Build	1,540	36,200	4,180
	Preferred	1,430	34,200	4,620

4.7.2 Microscale Analysis

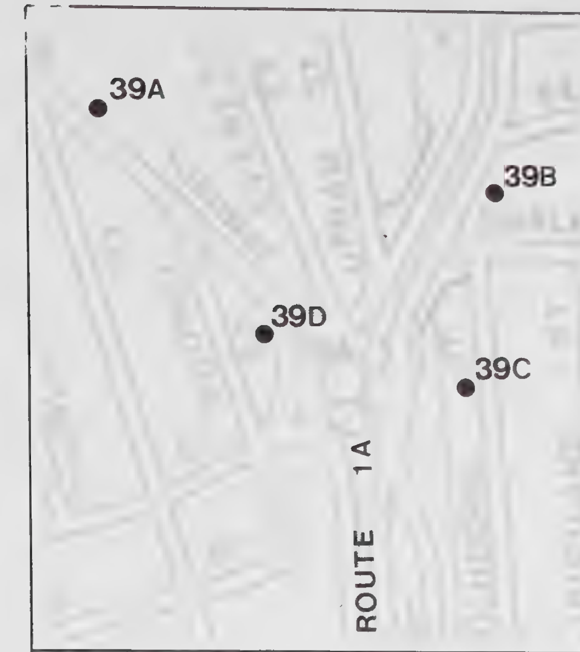
Comparison of Alternatives

CO concentrations at selected receptor locations in the project area were estimated for all of the build and the No-Build alternatives. For all alternatives examined, no one-hour CO concentrations in excess of the 35-ppm standard were found. CO concentrations at all receptors were estimated to decrease with time except with the No-Build Alternative, where CO concentrations at heavily congested areas actually show an increase in 2010 after an initial decrease in 1990. There are a number of areas where eight-hour CO concentrations were estimated to be in excess of the 9-ppm standard in 1982. These violations would continue into the future with a No-Build Alternative. The excessive eight-hour CO concentrations anticipated for the area around the Sumner Tunnel portal would be alleviated with a new tunnel. Without a new tunnel (i.e., with the No-Build Alternative or Alternative 6), violation of the 9-ppm standard is anticipated in this area. Compared with the No-Build Alternative, one- and eight-hour CO concentrations at most of the receptor locations analyzed are expected to decrease with the build alternatives either because of the removal of the motor vehicle emissions on the street (e.g., by depressing the Central Artery) or the diversion of traffic to a different and less congested corridor (i.e., with a ne tunnel). CO emissions from the ventilation buildings are not expec to contribute significantly to eith the total one- or eight-hour CO concentrations.

Preferred vs. No-Build Alternative

Estimates of the maximum one-hour CO concentrations for the Preferred and the No-Build Alternatives are shown in Table 48. No violations of the one-hour standar 35 parts per million (ppm) were estimated. With very few exceptio CO concentrations at all receptor locations examined show a decrease with the Preferred Alternative whe compared with the No-Build. The geographical locations of the vari receptors selected in this analysi are shown on Figure 57.

With the depression of the Central Artery, a significant porti of the emissions from the streets would be removed (and discharged through elevated exhausts in ventil tion buildings). This removal is responsible for the significant reduction in CO concentrations at s receptor locations as the Quincy Market (Receptor No. 13) and Martignetti's (No. 14). A new harb tunnel crossing is also expected to relieve the existing congestion at Sumner Tunnel portal in East Boston



Air Quality Receptor Locations—Bell Circle, Revere

0 125 250 500 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

Figure 57
Air Quality Receptor Locations

0 900 1800 Feet

EIS/EIR for I-90–Third Harbor Tunnel; I-93–Central Artery

Numbers Indicate Receptor Location Identified in Text

NST #18 – From BRA North Station Study

Table 48

ESTIMATED MAXIMUM ONE-HOUR CARBON MONOXIDE CONCENTRATIONS*
AT SELECTED RECEPTOR LOCATIONS

Receptor Locations	1982	1990 Alternatives		2010 Alternatives	
		No-Build	Preferred	No-Build	Prefer
1. Rotch Playground	17	13	12	11	11
2. Columbus Park	9	6	5	4	4
3. Res., Old Colony Ave.	10	7	6	6	5
4. Broadway Station	10	6	9	5	8
5. Tea Party Ship	12	10	8	9	6
6. Children's Museum	13	9	6	8	5
7. Reserve Bank	25	15	9	17	8
8. Stone & Webster	17	14	8	13	7
9. U.S. Postal Annex	13	10	6	9	5
10. CO Monitor - Kneeland	19	15	10	12	8
11. Tai Tung Park	16	13	9	11	8
12. N.E. Aquarium	15	10	6	9	5
13. Quincy Market	23	25	9	26	7
14. Martignetti's	21	28	8	29	7
15. Res., nr. Vent	15	13	7	13	6
16. Playgrd., Commercial	27	19	16	18	15
17. West End Apts.	16	12	8	7	7
18. Tennis Courts	21	14	12	14	11
19. City Square	29	22	21	21	21
20. Heritage Apts.	11	7	4	7	3
21. Maverick Square	15	10	5	11	4
22. Paris St. Health Ctr.	16	13	5	14	4
23. Res., Havre St.	33	23	5	28	4
24. Daniel Webster School	14	8	5	8	4
25. Day Square	13	7	7	6	5
26. Porzio Park	7	6	4	4	3
27. E. Bos. Mem. Stadium	12	9	5	5	4
28. Hilton Hotel	12	9	6	6	5
29. N. End. nr. Sumner Vent.	13	8	7	6	6
30. South Bay nr. Vent VO	9	6	10	6	9
31. Sumner/Cottage @ V2	9	5	4	4	3
32. Chelsea St. nr. Sumner Vent.	15	5	4	4	3
33. Central Sq., E. Boston	24	12	5	5	5
34. Atlantic Ave., nr. V1	19	14	10	14	8
35. 259 A St.	10	7	6	6	4
36 W. 1st & E. St	10	6	4	6	4
37. Summer & E 1st	10	6	4	4	3
38. BOSCOM	10	7	4	5	4
39. Mooney @ Bell Circle	12	8	8	8	7

*Concentrations are given in parts per million (ppm). The one-hr standard is 35 ppm. All entries include background concentrations of 4 ppm in 1982, 2.1 ppm in 1990, and 1.6 ppm in 2010. Concentrations are rounded to nearest ppm.

S nificant improvement in the air q lity is therefore anticipated at s h areas as Havre Street (No. 23) a Paris Street (No. 22) with the p ferred Alternative. Very little i pact, in terms of changes in CO c centrations, is expected for r ceptors located either in the r sidential area or the industrial n rthwest section of South Boston. T only area where one-hour CO c centrations are expected to in- c ease with the Preferred Alternative i in the South Bay (Receptor No. 30), a area used by Amtrak, Conrail, and TA Red Line storage, where the rald Street Extension will introduce new intersection and bring addi- t onal traffic into this area. Even w th this additional traffic, the ximum one-hour CO concentration was timated at 10 ppm, which is well low the standard.

When the Central Artery is pressed, the emissions within the closed tunnels will be discharged rough ventilation buildings. The fects of the vent emissions on ximum one-hour CO concentrations are ite insignificant - ranging from out 0.2 to 0.7 ppm. Contributions om these ventilation buildings to ceptor locations in South Boston are ypically between 0.1 and 0.3 ppm; in ast Boston, the contributions are etween 0.2 and 0.3 ppm.

Table 49 shows the maximum ight-hour CO concentrations for the referred and the No-Build Alterna- ives. Eight-hour CO concentrations n excess of the 9-ppm standard were stimated in many areas throughout the roject corridor under baseline 1982 onditions. These excessive CO oncentrations would continue into 990 and 2010 with the No-Build lternative. With the Preferred lternative, eight-hour CO concentra- ions are expected to decrease at lmost every receptor location exam- ned. No violation of the standard was estimated anywhere, although the -ppm standard was met for the recep- tor at City Square in Charlestown. This particular area is generally naffected by project alternatives.

Eight-hour CO violations were estimated at Quincy Market (Receptor No. 13), Martignetti's (No. 14) and Leverett Circle (No. 18) with the No-Build Alternative. These violations are eliminated with the Preferred Alternative. The congestion at the Sumner Tunnel portal and the resulting violation of the standard (e.g., the 14 ppm concentration for a receptor at Havre Street) with the No-Build Alternative is alleviated by a new tunnel. The significant improvement in the air quality at this site is due to dramatic reduction in queue times in the Sumner Tunnel when the new tunnel is in operation. Eight-hour CO concentrations at various receptor locations in South Boston are well below the 9-ppm standard with both the Preferred and the No-Build Alternatives. For a receptor located in the South Bay area (Receptor No. 30), the new intersection and the additional traffic with the Preferred Alternative is expected to result in an increase of CO concentration. However, the maximum concentration of 7 ppm is still below the corresponding eight-hour standard.

CO emissions from the ventilation buildings do not contribute significantly to the total eight-hour CO concentrations at any of the receptor locations examined. Contributions from these ventilation buildings to receptor locations in South Boston and in East Boston are in the range of 0.1 to 0.2 ppm. The maximum contribution of about 0.5 ppm was estimated for a receptor location at Atlantic Avenue (Receptor No. 34). The total eight-hour CO concentration at this receptor location is 5 ppm, which is well below the 9-ppm standard.

Mitigating Measures

No excessive one- or eight-hour CO concentrations were estimated for any of the receptors analyzed with the Preferred Alternative. In fact, the estimated concentrations are conservative because the emissions reduction credit for the Commonwealth's Inspection/Maintenance program was not included in the analysis. The I/M

Table 49

ESTIMATED MAXIMUM EIGHT-HOUR CARBON MONOXIDE CONCENTRATIONS*
AT SELECTED RECEPTOR LOCATIONS

	Receptor Locations	1982	1990 Alternatives		2010 Alternatives	
			No-Build	Preferred	No-Build	Preferr
1.	Rotch Playground	11	6	7	5	6
2.	Columbus Park	6	3	3	3	3
3.	Res., Old Colony Ave.	6	5	4	4	3
4.	Broadway Station	6	4	6	3	5
5.	Tea Party Ship	7	5	4	4	4
6.	Children's Museum	7	5	3	4	3
7.	Reserve Bank	10	8	5	8	4
8.	Stone & Webster	11	7	4	7	4
9.	U.S. Postal Annex	7	5	4	4	3
10.	CO Monitor - Kneeland	13	9	7	9	7
11.	Tai Tung Park	10	8	5	6	4
12.	N.E. Aquarium	9	6	4	5	3
13.	Quincy Market	11	10	6	10	6
14.	Martignetti's	13	14	5	15	5
15.	Res., nr. Vent	10	6	4	6	3
16.	Playgrd., Commercial	9	7	5	6	5
17.	West End Apts.	9	7	5	8	5
18.	Tennis Courts	14	11	8	12	7
19.	City Square	12	10	9	9	9
20.	Heritage Apts.	7	5	3	5	2
21.	Maverick Square	8	6	3	6	3
22.	Paris St. Health Ctr.	9	7	3	8	3
23.	Res., Havre St.	17	14	3	16	3
24.	Daniel Webster School	6	6	3	7	3
25.	Day Square	8	7	5	5	4
26.	Porzio Park	5	3	3	3	2
27.	E. Bos. Mem. Stadium	7	5	3	6	2
28.	Hilton Hotel	7	5	4	6	3
29.	N. End. nr. Sumner Vent.	9	5	4	4	3
30.	South Bay nr. Vent VO	6	4	7	3	6
31.	Sumner/Cottage @ V2	5	3	3	3	2
32.	Chelsea St. nr. Sumner Vent.	7	4	3	3	3
33	Central Sq., E. Boston	11	8	4	8	3
34.	Atlantic Ave., nr. V1	10	7	5	6	4
35.	259 A St.	6	4	3	3	2
36.	W. 1st & E. St.	6	4	3	3	2
37.	Summer & E 1st	6	4	3	3	3
38.	BOSCOM	6	4	3	3	2
39.	Mooney @ Bell Circle	8	5	5	4	4

*Concentrations are given in parts per million (ppm). The eight-hr standard is 9 ppm. All entries include background concentrations of 3.2 ppm in 1982, 1.7 ppm in 1990, and 1.3 ppm in 2010. Concentrations are rounded to nearest ppm.

crdit would reduce the estimated ccentrations presented in Tables 48 ar 49. Consequently, no mitigating mesures are proposed.

4.3 Effects of Toll Plazas

Cmparison of Alternatives

The effects of motor vehicle eissions at toll plazas are measured i terms of their potential for eceeding the eight-hour CO standard ad the Massachusetts one-hour NO_2 plicy level. A number of receptors i the proximity of the existing tolls i East Boston and the proposed toll plaza were selected to monitor this ipact.

With the No-Build Alternative, te delays at the existing Sumner Tnnel toll booths will continue to gt worse. This problem is expected t result in eight-hour CO concentra-tons that are in excess of the 9-ppm sandard, and one-hour NO_2 concen-trations that exceed the Common-ealth's policy level of 320 micro-rams per cubic meter (ug/m^3). epression of the Central Artery alone Alternative 6) will not alleviate his congestion at the tunnel portals n East Boston. Therefore, with lternative 6, the problem with the ight-hour CO and one-hour NO_2 will ontinue to persist. With the Pre-erred Alternative and Alternatives 2, , 3A, 4, 5, and 5A, a dramatic eduction in delay is anticipated at he toll plaza. Consequently, the ight-hour CO and one-hour NO_2 oncentrations at all receptor loca-ions in the vicinity of the toll laza were estimated to be well below he corresponding standard and policy evel. Receptor locations in both the esidential area and the industrial orthwest section of South Boston will ot be affected by the new toll plaza associated with the Preferred Alterna-tive.

Preferred vs. No-Build Alternative

For the Preferred Alternative, the toll plaza will be located in South Boston and a one-way toll system is assumed. Table 50 shows the maximum eight-hour CO concentrations from all toll plazas emissions for both the Preferred and the No-Build Alternatives. The new cross harbor tunnel reduces the average queue time for a vehicle during peak hours at both the Sumner and the Callahan Tunnels. With the Preferred Alterna-tive, the average delay anticipated for the Sumner Tunnel is about 0.3 minutes, which is significantly below the corresponding delay of 10.8 minutes with the No-Build Alterna-tive. For the new toll plaza in South Boston, the average delay for inbound traffic is estimated at less than 0.2 minutes. Because of these short queue times associated with the Preferred Alternative, the maximum eight-hour CO concentrations at all of the receptors examined are less than 0.2 ppm. These concentrations are quite insignificant when measured against the corresponding 9-ppm standard. With the No-Build Alternative, on the other hand, excessivelyhigh eight-hour CO concentrations are anticipated for receptors that are located in the proximity of the Sumner and Callahan Tunnel portals in East Boston. For example, the 8.8 ppm estimated for the receptor on Havre Street represents a significant contribution to the 14 ppm total eight-hour CO concentration at this site (see Table 49). Impact from toll plaza emissions on eight-hour CO concentrations at the various receptors' locations in South Boston is expected to be insignificant (less than 0.2 ppm).

Table 50 also shows the effects of the toll plaza emissions on maximum one-hour NO_2 concentrations. Again because of the short queue times associated with the Preferred Alterna-tive, maximum one-hour NO_2 concen-trations for receptors located in both East Boston and South Boston are expected to be very low (less than 10 ug/m^3). When a background concen-tration of 170 ug/m^3 is added to the toll plaza component for receptor locations in East Boston, and 224 ug/m^3 is added to the South Boston locations, the resulting one-hour concentrations would still be well

Table 50

CONTRIBUTIONS OF TOLL PLAZA EMISSIONS TO MAXIMUM 8-HOUR CARBON MONOXIDE AND 1-HR NO_2 CONCENTRATIONS* FOR VARIOUS ANALYSIS YEARS

Receptor Locations	1982	1990 Alternatives		2010 Alternatives	
		No-Build	Preferred	No-Build	Preferred
8-Hr CO					
EAL Reservation Center	1.0	0.6	<0.2	0.8	<0.2
Porzio Park	1.0	0.9	<0.2	1.1	<0.2
BIF Park (proposed)	0.3	0.6	<0.2	0.9	<0.2
Maverick Square	2.3	1.8	<0.2	2.4	<0.2
Residents, Orleans/Porter	2.4	1.3	<0.2	1.6	<0.2
Residents, Bremen/Porter	4.0	2.1	<0.2	2.6	<0.2
Residents, Bremen/Gove	3.7	3.4	0.2	4.7	<0.2
Residents near Sumner Toll	7.8	5.7	<0.2	8.0	<0.2
Residents on Havre St	11.7	8.8	<0.2	11.5	<0.2
Bldg @ 259 A St	<0.2	<0.2	<0.2	<0.2	<0.2
W. 1st & E Sts	<0.2	<0.2	<0.2	<0.2	<0.2
Sumner & E 1st Sts.	<0.2	<0.2	<0.2	<0.2	<0.2
Boscom	<0.2	<0.2	<0.2	<0.2	<0.2
Pier 4 Restaurant	<0.2	<0.2	<0.2	<0.2	<0.2
Barnes Bldg	<0.2	<0.2	<0.2	<0.2	<0.2
1-Hr NO_2					
EAL Reservation Center	51	35	<10	63	<10
Porzio Park	36	47	<10	56	<10
BIF Park (proposed)	13	40	<10	53	<10
Maverick Square	108	118	<10	171	<10
Residents, Orleans/Porter	150	109	<10	152	<10
Residents, Bremen/Porter	383	281	<10	375	<10
Residents, Bremen/Gove	189	242	<10	359	<10
Residents near Sumner Toll	293	296	<10	486	<10
Residents on Havre St	463	485	<10	686	<10
Bldg @ 259 A St	<10	<10	<10	<10	<10
W. 1st & E Sts	<10	<10	<10	<10	<10
Sumner & E 1st Sts	<10	<10	<10	<10	<10
Boscom	<10	<10	<10	<10	<10
Pier 4 Restaurant	<10	<10	<10	<10	<10
Barnes Bldg	<10	<10	<10	<10	<10

*Concentrations are given in parts per million (ppm) for CO, and micrograms per cubic meter ($\mu g/m^3$) for NO_2. These entries do not include background levels. The 8-hr CO standard is 9 ppm, and the state's policy level for 1-hr NO_2 is 320 $\mu g/m^3$. To compare with these standards and criteria, the 8-hr CO background concentrations 3.2, 1.7, and 1.3 ppm for 1982, 1990 and 2010 respectively, and the 1-hr NO_2 background concentrations of 170 $\mu g/m^3$ (for sites in East Boston) and 224 $\mu g/m^3$ (for all other sites) should be added to these tabular entries.

below the Commonwealth's policy level of 320 ug/m^3. With the No-Build Alternative, however, excessively high one-hour NO_2 concentrations are anticipated for receptor locations in the proximity of the existing tunnel portals in East Boston. For example, with the No-Build Alternative in 1990, toll plaza emissions alone will result in one-hour NO_2 concentrations that are in excess of the 320 ug/m^3 policy level. No problem with respect to excessively high one-hour NO_2 concentrations is anticipated for receptor locations in South Boston either with the Preferred or the No-Build Alternative.

Mitigating Measures

The air quality effects of the toll plazas associated with the Preferred Alternative are quite insignificant when measured in terms of either the eight-hour CO or the one-hour NO_2 concentrations. Consequently, no mitigating measures are needed for the toll plaza emissions with the Preferred Alternative.

.7.4 Concentrations in the Tunnels

Comparison of Alternatives

Maximum one-hour CO and NO_2 concentrations in the various tunnel segments were estimated for all project alternatives. The maximum one-hour CO concentrations in the tunnels under peak hour traffic conditions were estimated to range from about 19 to 54 mg/m^3 in 1990 with the various build alternatives. These concentrations are below the 1982 estimates for the existing tunnels, and are within the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) guideline of 143 mg/m^3 for maximum one-hour CO concentration. In 2010, the concentrations in the tunnels would decrease further with all alternatives as compared to the corresponding No-Build Alternative concentrations. With the exception of Alternative 6, CO concentrations in the Sumner, Callahan, and Dewey Square tunnels were anticipated to decrease dramatically with all of the build alternatives. This decrease is due to diversion of cross-harbor traffic to the new harbor tunnel. Because Alternative 6 has no new cross-harbor tunnel, the CO concentrations in the Sumner and Callahan tunnels are comparable to the corresponding No-Build Alternative concentrations.

Maximum one-hour NO_2 concentrations in the various tunnel segments for the build alternatives were estimated to range from about 1,600 to 4,000 ug/m^3 in 1990. The higher NO_2 concentration in this range is anticipated for tunnel segments of Alternative 6. There are presently no applicable standards governing maximum allowable one-hour NO_2 concentrations in a tunnel. In all instances, however, the estimated NO_2 concentrations in the various tunnel segments are comparable to or less than NO_2 concentrations estimated for the existing tunnels in 1982. NO_2 concentrations in all existing tunnels were estimated to decrease significantly for all build alternatives except Alternative 6. For Alternative 6, the one-hour NO_2 concentrations in the Sumner and Callahan Tunnels were estimated to be comparable to the corresponding No-Build Alternative concentrations.

Preferred vs. No-Build Alternative

Estimated maximum one-hour CO concentrations in the various tunnel segments during peak hour traffic conditions and assuming all ventilation fans in operation are shown in Table 51 for both the Preferred and the No-Build Alternatives. These concentrations range from about 17 to 36 mg/m^3 in 1990. If a background CO of about 2.4 mg/m^3 is added to these concentrations, the CO concentration in 1990 would range from about 19 to 38 mg/m^3. These concentrations are acceptable and are within the ASHRAE guideline of 143 mg/m^3. Compared with the No-Build Alternative, CO concentrations in the Sumner, Callahan, and Dewey Square Tunnels would decrease dramatically with the Preferred Alternative. For example, the one-

Table 51

ESTIMATED MAXIMUM ONE-HOUR CARBON MONOXIDE CONCENTRATIONS* IN THE VARIOUS TUNNELS

	Tunnel Description	1982	1990 Alternatives		2010 Alternatives	
			No-Build	Preferred	No-Build	Preferred
V0	Segments in South Bay	-	-	28	-	24
V1	Segments at Northern Ave	-	-	31	-	25
V3	Segments at Harbor Towers	-	-	36	-	27
V4	Segments at North End	-	-	34	-	26
V5	Segments at Causeway St.	-	-	35	-	28
V7	Segments at A and Summer St.	-	-	20	-	19
V8	Segments at Viaduct and Summer	-	-	22	-	22
V9	Segments at Naval Base	-	-	29	-	26
V10	Bird Island Flats	-	-	28	-	27
V11/V12	Segments - Sumner Tunnel	86	57	19	60	18
V13/V14	Segments - Callahan Tunnel	76	62	21	61	19
V15/V16	Segments - Dewey Sq. SB Tunnel	69	63	20	54	16
V17/V18	Segments - Dewey Sq. NB Tunnel**	51	43	17	34	13

*Concentrations are in milligrams per cubic meter (mg/m^3). The ASHRAE guideline for one-hr CO concentrations is 143 mg/m^3. These maximum concentrations are based on design conditions and do not include background levels. To compare with the ASHRAE guideline, the one-hr CO background concentrations of 4.6, 2.4, and 1.8 mg/m^3 for 1982, 1990 and 2010, should be added to these entries.

**Part of the Dewey Square NB Tunnel will be converted into a southbound tunnel for the Preferred Alternative.

hour CO concentration of 62 mg/m^3 estimated for the Callahan Tunnel with the No-Build Alternative, is expected to drop to about 21 mg/m^3 with the Preferred Alternative. This dramatic decrease is attributed to a shift of the cross-harbor traffic to the new tunnel.

Maximum one-hour NO_2 concentrations in the various tunnel segments were also estimated under the same set of peak hour conditions. The results are shown in Table 52. With the Preferred Alternative, the maximum one-hour NO_2 concentrations in 1990 were estimated to range from 1,600 ug/m^3 (or 1.6 mg/m^3) to 3,400 ug/m^3 (or 3.4 mg/m^3). When a background NO_2 concentration of about 224 ug/m^3 for the Boston segments and 170 ug/m^3 for the East Boston segments is added to the modeling predictions, the anticipated concentrations in the tunnel in 1990 would range from about 1,820 to 3,620 ug/m^3. In 2010, these concentrations are expected to decrease slightly. As mentioned previously, there are no ASHRAE guidelines or applicable standards governing maximum one-hour NO_2 concentrations in a tunnel environment. Under peak hour traffic conditions with all ventilation fans in operation, these one-hour NO_2 concentrations are lower than the NO_2 concentrations encountered in the existing tunnels in 1982. When compared with the No-Build Alternative, maximum one-hour NO_2 concentrations in the Sumner, Callahan, and Dewey Square Tunnels are expected to decrease dramatically with the Preferred Alternative because of diversion of cross-harbor traffic to the new tunnel.

Mitigating Measures

Air quality in the existing tunnels, the new tunnels, and the depressed Central Artery is acceptable, based on the peak hour traffic conditions indicated in Section 4.2, and with all ventilation fans in operation. However, should traffic conditions in the tunnels degrade, for example, due to an accident, and/or there is mechanical malfunctioning in the ventilation fans, then excessively high CO and NO_2 concentrations could result. To avoid this potential health hazard, the mechanical ventilation system of the proposed tunnels must be maintained in good working order at all times and a procedure for deploying the necessary number of fans in operation (as a function of the CO concentrations in the tunnel, CO in the intake air, and traffic conditions) must be developed. Additionally, a real-time CO monitoring system in the proposed tunnels must also be installed. These mitigating measures will be included in the proposed ventilation system designs for the new tunnels.

4.7.5 Effects of Ventilation Building Emissions

Comparison of Alternatives

The effects of ventilation building emissions on ambient air quality were evaluated using two analytical methods: (1) EPA's ISC model for the "far-field" impact and using the same set of receptors that were used for the microscale analysis; and (2) Halitsky's algorithm for the "near-field" environment for receptors that are located at pedestrian sidewalk level in the immediate vicinity of the individual vents, and at air intakes on rooftops of adjacent buildings. Maximum one- and eight-hour CO, and one-hour NO_2 concentrations were estimated for all project alternatives. The far-field analysis suggests that with very few exceptions, maximum one-hour NO_2 concentrations at the various receptors selected for this analysis were estimated to be less than the Commonwealth's policy level of 320 ug/m^3. The exceptions include a receptor in the North End in the vicinity of an existing ventilation building, where the 1990 concentration with Alternative 6 was estimated at about 350 ug/m^3; and another receptor at Atlantic Avenue where concentrations in the range of 330 to 460 ug/m^3 were estimated for Alternatives 3, 3A, 5, and 6 in 1990. CO concentrations at all receptor

Table 52

ESTIMATED MAXIMUM ONE-HOUR NITROGEN DIOXIDE CONCENTRATIONS* IN THE VARIOUS TUNNELS

	Tunnel Description	1982	1990 Alternatives		2010 Alternatives	
			No-Build	Preferred	No-Build	Preferred
V0	Segments in South Bay	-	-	2.7	-	2.5
V1	Segments at Northern Ave.	-	-	3.1	-	2.6
V3	Segments at Harbor Towers	-	-	3.4	-	2.9
V4	Segments at North End	-	-	3.3	-	2.8
V5	Segments at Causeway St.	-	-	3.3	-	3.0
V7	Segments at A and Summer St.	-	-	2.0	-	2.0
V8	Segments at Viaduct And Summer St.	-	-	2.2	-	2.2
V9	Segments at Naval Base	-	-	2.9	-	2.7
V10	Segments at Bird Island Flats	-	-	2.4	-	2.5
V11/V12	Segments at Sumner Tunnel	4.2	2.4	1.6	2.2	1.7
V13/V14	Segments at Callahan Tunnel	3.7	2.7	1.8	2.3	1.7
V15/V16	Segments at Dewey Sq. SB Tunnel	4.3	3.5	1.9	3.0	1.7
V17/V18	Segments at Dewey Sq. NB Tunnel**	3.2	2.4	1.6	1.9	1.4

*Concentrations are in milligrams per cubic meter (mg/m^3). These maximum concentrations are based on design conditions and do not include background levels. To obtain total NO_2 concentrations in the tunnels, the one-hr NO_2 background concentrations of 0.170 mg/m^3 (or 170 ug/m^3) for East Boston segment(s) and 0.224 mg/m^3 (or 224 ug/m^3) for all other segments should be added to these tabular entries. There are presently no ASHRAE guidelines or standards that apply to maximum one-hr NO_2 levels in a tunnel.

**Part of the Dewey Square NB Tunnel will be converted into a southbound tunnel for the Preferred Alternative.

locations for all project alternatives were estimated to be insignificant when measured against the contributions from other mobile sources or the appropriate one- and eight-hour CO standards.

The impact of the emissions from ventilation buildings is mostly felt in a near-field environment. The near-field analysis suggests that with few exceptions, maximum one-hour NO_2 concentrations at these close-by receptors would exceed the Commonwealth's policy level. All the ventilation buildings associated with the depression of the Central Artery, as analyzed in this EIS/EIR, are expected to result in excessive NO_2 concentrations for all build alternatives examined. Similarly, emissions from the ventilation buildings in the North End, in the Dewey Square area, and in South Boston are expected to result in one-hour NO_2 concentrations that are in excess of the policy level for all alternatives. The exceptions are the existing ventilation buildings in East Boston where NO_2 concentrations, even with the No-Build Alternative and Alternative were estimated to be below the 320 ug/m^3 policy level. Further air quality modeling and analysis must be performed to develop a ventilation system which conforms to the NO_2 policy level.

Preferred vs. No-Build Alternative

The Far-Field Results

The effects from all ventilation buildings on the various receptor locations are shown in Table 53 for the Preferred and the No-Build Alternatives. The maximum one-hour NO_2 concentrations with the Preferred Alternative were estimated to range from about 12 to 82 ug/m^3 in 1990. These concentrations do not represent any problem with the Commonwealth's policy level of 320 ug/m^3, even after a high one-hour NO_2 background of 224 ug/m^3 is added to the modeling results. The Preferred Alternative includes several new ventilation buildings along the Central Artery corridor and in South Boston. Consequently, the maximum one-hour NO_2 concentrations at a number of receptor locations in downtown Boston, the North End, and South Boston are expected to increase with the Preferred Alternative. As will be noted later in this subsection, violations of the Commonwealth's policy level for NO_2 emissions may require re-siting of many of the proposed ventilation buildings. During the design phase, the final locations of the required ventilation buildings will be determined based on additional air quality analyses.

In East Boston, on the other hand, the decrease in traffic using the Sumner and Callahan Tunnels with the Preferred Alternative is expected to result in lower NO_x emissions from the existing ventilation buildings and subsequent lower NO_2 concentrations. For example, maximum one-hour NO_2 concentrations (with background) at Maverick Square were estimated to decrease from about 220 ug/m^3 with the No-Build Alternative to about 190 ug/m^3 with the Preferred Alternative. The 2010 maximum one-hour NO_2 concentrations are generally lower than their corresponding 1990 concentrations. Therefore, no concentrations in excess of the Commonwealth's policy level are anticipated in East Boston.

In 1990, the maximum one-hour CO concentrations at the various receptor locations with the Preferred Alternative were estimated to range from about 0.2 to 0.7 ppm. These concentrations are quite insignificant when measured against contributions from the mobile sources or the 35-ppm standard (see Section 4.7.2 Microscale Analysis). The maximum eight-hour CO concentrations were estimated to range from about 0.1 to 0.5 ppm. These concentrations are also insignificant when compared with the 9-ppm standard. CO concentrations in 2010 are generally expected to be even lower. Consequently, no problem with respect to the one- and eight-hour standards is anticipated in 2010 due to emissions from any of the ventilation

Table 53

CONTRIBUTIONS OF VENTILATION BUILDING EMISSIONS ON ONE-HOUR NITROGEN DIOXIDE CONCENTRATIONS*

	Receptor Locations	1982	1990 Alternatives		2010 Altern
			No-Build	Preferred	No-Build
1.	Rotch Playground	44	32	21	27
2.	Columbus Park	14	10	22	9
3.	Residence - Old Colony Ave	27	20	28	17
4.	Broadway Station	29	21	22	8
5.	Tea Party Ship	28	22	33	18
6.	Children's Museum	29	22	30	19
7.	Reserve Bank	34	27	18	23
8.	Stone & Webster	61	45	35	37
9.	U.S. Postal Annex	43	34	24	29
10.	CO Monitor - Kneeland	75	61	38	52
11.	Tai Tung Park	67	50	33	43
12.	N.E. Aquarium	46	35	25	30
13.	Quincy Market	37	25	21	22
14.	Martignettis	51	31	28	28
15.	Residence Near Vent	124	72	69	66
16.	Playground on Commercial	27	21	38	18
17.	West End Apartments	16	13	19	11
18.	Tennis Courts	12	9	18	8
19.	City Square	32	20	34	18
20.	Heritage Apartments	69	40	20	37
21.	Maverick Square	83	48	22	44
22.	Paris St. Health Center	42	25	16	23
23.	Residence on Havre	49	33	30	29
24.	Daniel Webster School	27	21	25	18
25.	Day Square	25	17	16	15
26.	Porzio Park	20	12	15	11
27.	E. Boston Mem. Stadium	44	30	27	26
28.	Hilton Hotel	12	8	15	7
29.	North End, near Vent	41	28	42	24
30.	South Bay near VO	37	28	68	24
31.	Sumner/Cottage near V2	29	17	23	15
32.	Chelsea St., near Vent	29	19	14	17
33.	Central Square, East Boston	36	24	32	21
34.	Atlantic Ave., near V1	33	23	82	20
35.	Bldg., 259 A St	35	27	28	23
36.	W 1st & E St	15	11	18	9
37.	Summer & E 1st St	15	11	12	9
38.	BOSCOM	23	18	24	15

*Concentrations are in micrograms per cubic meter ($\mu g/m^3$), and do not background concentrations. The state policy level for one-hr NO_2 is 320 $\mu g/m^3$. To compare with this policy level, a background concentra 224 $\mu g/m^3$ for Boston sites, and 170 $\mu g/m^3$ for East Boston sites shoul added to these estimates.

buildings.

The Near-Field Results

The effects of ventilation building emissions in a near-field environment are assessed by considering one vent at a time and estimating the maximum one-hour concentrations for receptors at pedestrian sidewalk level and at air intakes on the roofs of adjacent buildings. Table 54 shows the maximum one-hour NO_2 concentrations for each of the proposed ventilation buildings with the Preferred and the No-Build Alternatives. Again, note that the final ventilation building locations will be determined during the design phase after additional air quality analyses have been performed.

The emissions from each of the ventilation buildings associated with the depression of the Central Artery (i.e., vent stack No. V0 through V5 in Table 54) are expected to result in one-hour NO_2 concentrations at nearby receptor locations that are in excess of the 320 ug/m^3 policy level. For a number of receptors located at air intakes on the roofs of adjacent buildings, the estimated maximum one-hour NO_2 concentrations in excess of the Commonwealth's policy level are also anticipated for receptors at pedestrian sidewalk level and rooftop air intakes close to these ventilation buildings. Because of a lower background concentration (170 ug/m^3) assumed for East Boston, the emissions from the ventilation building at Bird Island Flats would not result in excessive NO_2 concentrations, except for the receptor at the sidewalk where the maximum one-hour NO_2 concentration was estimated at about 330 ug/m^3 (just over the 320 ug/m^3 policy level).

One-hour NO_2 concentrations associated with the existing ventilation buildings in East Boston are not expected to be in excess of the Commonwealth's policy level with either the Preferred or the No-Build Alternatives. Emissions from the existing ventilation buildings in the North End and in the Dewey Square area, on the other hand, will continue to result in maximum one-hour NO_2 concentrations that are in excess of the policy level. Because the Preferred Alternative is expected to result in significant reduction in emissions from the ventilation buildings serving the Dewey Square tunnels, NO_2 concentrations at pedestrian level in the vicinity of these ventilation buildings were estimated to be below the Commonwealth's policy level. However, even with this emission reduction, NO_2 concentrations at a number of rooftop air intake locations were still estimated to exceed the 320 ug/m^3 policy level. Maximum one-hour NO_2 concentrations in 2010 were estimated to be only slightly lower than the corresponding 1990 results.

Maximum one-hour CO concentrations at receptors located in the immediate vicinity of the proposed ventilation buildings were estimated to range from about 3.0 to 7.7 mg/m^3 with backgound CO concentration in 1990 under the Preferred Alternative. These concentrations are well below the one-hour standard of 40 mg/m^3. The maximum eight-hour CO concentrations were estimated to range from about 2.4 to 6.2 mg/m^3, with background. These concentrations are also within the eight-hour CO standard. Both maximum one- and eight-hour CO concentrations in 2010 were estimated to be less than the corresponding 1990 concentrations. Therefore, CO emissions from these ventilations are not expected to be a problem with respect to exceeding the applicable standards.

Mitigating Measures

If a one-hour NO_2 background concentration of 170 ug/m^3 is assumed for East Boston receptor locations, and 224 ug/m^3 is assumed for the rest of the study area in Boston, then emissions from most of the ventilation buildings analyzed -- existing and proposed -- would result in excessive one-hour NO_2 concentrations when measured against the Commonwealth's policy level of 320

Table 54

EFFECTS OF VENTILATION BUILDING EMISSIONS ON MAXIMUM ONE-HOUR NITROGEN DIOXIDE CONCENTRATIONS* IN THE IMMEDIATE VICINITY OF THE VENTS

Stack Description		Receptor Location	1982	1990 Alternative No-Build	1990 Alternative Preferred	2010 Alternative No-Build	2010 Alternative Preferred
V0 @ South Bay	V0R1	Sidewalk	-	-	261	-	238
	V0R2	@ Gillette (SW)**	-	-	108	-	98
	V0R3	Bwy. T. (SW)	-	-	80	-	73
	V0R4	Post Office (R)	-	-	216	-	196
V1 @ Northern Ave.	V1R1	Sidewalk	-	-	293	-	247
	V1R3	Sheraton Bldg. (R)	-	-	350	-	295
	V1R4	Victoria Sta. (SW)	-	-	122	-	103
V3 @ Harbor Towers	V3R1	Sidewalk	-	-	288	-	243
	V3R2	Office @ High (R)	-	-	402	-	340
	V3R3	Harbor Towers (R)	-	-	347	-	293
	V3R4	Wkwy. @ Stella (SW)	-	-	144	-	122
V4 @ Callahan Tunnel Portal	V4R1	Sidewalk	-	-	311	-	268
	V4R2	Hanover/Cross (SW)	-	-	247	-	212
	V4R3	Bldg. @ Fulton (R)	-	-	369	-	218
	V4R4	Bldg. @ North (R)	-	-	412	-	355
	V4R5	Quincy Mkt. (SW)	-	-	166	-	143
V5 @ Causeway St.	V5R1	Sidewalk	-	-	312	-	285
	V5R2	Stop & Shop (R)	-	-	506	-	461
	V5R3	Kearney Sq. Bldg. (R)	-	-	382	-	349
	V5R4	Polcari's (SW)	-	-	157	-	144
V7 @ A and Summer Sts.	V7R1	Sidewalk	-	-	183	-	180
	V7R2	259 A St. (R)	-	-	226	-	223
	V7R3	Boston Wharf (SW)	-	-	89	-	89

*Concentrations are in micrograms per cubic meter ($\mu g/m^3$), and do not include background concen-

EFFECTS OF VENTILATION BUILDING EMISSIONS ON MAXIMUM ONE HOUR ...
IN THE IMMEDIATE VICINITY OF THE VENTS

Stack Description		Receptor Location	1982	1990 Alternative No-Build	1990 Alternative Preferred	2010 Alternative No-Build	2010 Alternative Preferred
V8 @ Viaduct & Summer St.	V8R1	Sidewalk	-	-	221	-	222
	V8R2	Barnes Bldg. (R)	-	-	135	-	136
	V8R3	Commonwealth Flats (SW)	-	-	55	-	55
V9 @ Naval Base, So. Boston	V9R1	Sidewalk	-	-	276	-	259
	V9R2	Boston Marine Industrial Park (SW)	-	-	90	-	85
V10 @ Bird Island Flats	V10R1	Sidewalk	-	-	157	-	160
	V10R2	BIF Park South (SW)	-	-	83	-	84
	V10R3	BIF Office Bldg. (R)	-	-	134	-	136
V11 @ North St., North End	V11R1	Sidewalk	183	106	149	98	158
	V11R2	St. Stephens (SW)	32	92	129	85	136
	V11R3	Res. @ Clark (SW)	35	102	144	94	152
V12 @ Liverpool, E. Boston	V12R1	Sidewalk	118	68	149	63	158
	V12R2	Res. @ London (SW)	116	67	147	62	155
	V12R3	Maverick Sq. (SW)	104	60	132	56	139
V13 @ North Sq., North End	V13R1	Sidewalk	139	100	65	86	63
	V13R2	Seamen House (R)	23	167	108	144	105
	V13R3	Bldg. @ North (R)	30	212	138	183	134
	V13R4	North Sq. (SW)	128	91	59	79	58
V14 @ Decatur, E. Boston	V14R1	Sidewalk	160	114	65	99	63
	V14R2	Paris Health Ctr. (SW)	150	108	61	93	59
	V14R3	Res. @ Decatur (SW)	157	112	64	97	62
V15 @ Beach St., Boston	V15R1	Sidewalk	203	163	75	141	67
	V15R2	Bldg. @ Beach (R)	389	313	144	270	128
	V15R3	Res. @ Beach (SW)	208	167	77	145	68
	V15R4	Rest @ Hudson (R)	416	334	154	289	137

Table 54 (Cont'd.)

EFFECTS OF VENTILATION BUILDING EMISSIONS ON MAXIMUM ONE-HOUR NITROGEN DIOXIDE CONCENTRATIONS* IN THE IMMEDIATE VICINITY OF THE VENTS

Stack Description		Receptor Location	1982	1990 Alternative		2010 Alternative	
				No-Build	Preferred	No-Build	Preferred
V16 @ Summer St., Boston	V16R1	Sidewalk	169	136	75	117	67
	V16R2	Bldg. nr. Vent (R)	309	248	138	215	122
	V16R3	Essex Hotel (R)	166	133	74	115	66
	V16R4	Dewey Sq. Bldg. (SW)	145	117	65	101	57
V17 @ Essex St., Boston	V17R1	Sidewalk	160	118	68	96	58
	V17R2	Bldg. @ Essex (R)	275	203	117	165	100
	V17R3	Dewey Sq. (SW)	153	113	65	92	56
	V17R4	Essex Hotel (R)	185	136	79	111	68
V18 @ Atlantic, Boston	V18R1	Sidewalk	188	139	68	113	58
	V18R2	Bldg. on Purchase (R)	292	216	106	176	91
	V18R3	S. Station (R)	222	164	80	133	69
	V18R4	Fed. Reserve (SW)	172	127	63	104	53

ug/m^3. The project must conform with the NO_2 policy level. To mitigate this potential problem, a number of potential options must be fully evaluated. These options include: the height of the exhaust opening and/or the exit velocity of the exhaust gases could be altered to reduce the impact on nearby receptors; the exhaust gases from a given set of tunnel segments could be vented from more than one ventilation building in that general location (i.e., to achieve more diffuse source environment); the amount of exhaust gases could be reapportioned among the fixed set of ventilation buildings. Not all of these potential mitigating measures will be equally effective for all of the ventilation buildings. However, from the magnitude of these estimated one-hour NO_2 concentrations, it appears that by using these mitigating measures -- either individually or in some combination -- the Commonwealth's policy level can be met at every receptor examined. The necessary air quality analyses to determine the feasibility and effectiveness of these mitigating measures will be performed during the design stage of the project.

CO emissions from the ventilation buildings are not a problem with respect to either the one- or eight-hour standard. Consequently, no mitigating measures are required.

4.7.6 Construction Impacts

The air quality consequences of construction are described in terms of the impact of traffic disruption during construction, dust emissions from construction-related activities and exhaust odor from truck emissions.

Comparison of Alternatives

Increased traffic congestion and resulting high CO concentrations are anticipated during the construction period in a number of areas along the Central Artery corridor. This potential CO problem would apply to both the build as well as the No-Build Alternatives, because the No-Build Alternative would still involve redecking of the existing viaduct. For all build alternatives, traffic disruption on local streets in the northern industrial section of South Boston is also expected. However, the traffic volumes on these streets are generally not very heavy, and existing CO concentrations are well below the standards. Consequently, no potential CO problem is likely to take place in South Boston. All alternatives, except the No-Build Alternative and Alternative 6, are expected to affect local traffic in East Boston to some extent during construction. This impact will mostly be limited to the Airport proper for the Preferred Alternative and Alternatives 3, 3A, 5, and 5A.

Another potentially serious problem is impact due to dust emissions. Areas near construction staging areas or construction haul routes are expected to be adversely affected. The entire Central Artery corridor will be affected with every alternative, including the No-Build Alternative. South Boston will be affected to a varying extent - for example, alternatives with a cross-harbor tunnel will affect South Boston to a greater extent and for a longer period than will Alternative 6 or the No-Build Alternative. This impact, however, is expected to be confined to the Fort Point Channel area and the industrial section. The residential section of South Boston would be unaffected. With the exception of the No-Build Alternative and Alternatives 2, 4, and 6, dust emissions from the construction activities at the Airport are also expected to adversely affect many areas at the Airport (e.g., the Southwest Service area) and the eastern portion of the Jeffries Point community. Alternatives 2 and 4 would adversely affect the East Boston residential areas adjacent to the Conrail right-of-way.

Because of the proposed alignment of the tunnel of the Preferred Alternative, aircraft operations at the Southwest Terminal will also be affected during construction. The potential impact associated with this

temporary change in aircraft operation, however -- either in terms of changes in emissions or ambient concentrations at sensitive receptor locations in Jeffries Point -- is expected to be insignificant.

Preferred vs. No-Build Alternative

The impacts associated with traffic disruption, dust emissions and exhaust odor, and construction at Logan Airport that is applicable to the Preferred Alternative is described in greater detail below, and compared to potential impacts of the No-Build Alternative.

Traffic Disruption

During the construction period of the Preferred Alternative, adverse traffic effects due to reduced capacity and detouring traffic are anticipated for many locations in Boston, South Boston, and within Logan Airport. However, the details of the detour routing and the resulting traffic volumes on the affected roadway network have not been fully defined beyond the construction phasing program identified in Section 4.1 and in the Supportive Engineering Report. Consequently, the air quality implications of these traffic effects are examined qualitatively -- according to various geographical areas. When definitive detour routing and associated traffic volumes are developed (e.g., during the design stage), more detailed analysis of the potential air quality impact shall be performed to ensure compliance with applicable air quality standards and criteria.

o South Bay/Fort Point Channel

During the construction of the tunnel segment under the Fort Point Channel, the Congress Street Bridge will be narrowed. Traffic congestion is anticipated at intersections of bridges with roadways paralleling the Southeast Expressway and the Central Artery. If the traffic congestion is severe during some stage in the construction period, the potential to exceed the 9-ppm CO standard will increase.

o Downtown Boston/Waterfront

During the construction of t depressed Central Artery, the overa capacities of certain ramps from t viaduct and the Surface Artery are expected to be decreased. This los in capacity will lead to severe con gestion on both the viaduct and the Surface Artery. For five years dur the construction period, the Surfac Artery and Atlantic Avenue will be combined into one, six-lane arteria roadway, with some resulting loss o capacity. As noted in Section 4.2, however, traffic flow is not expect to be significantly affected becaus of removal of on-street parking and other factors which affect traffic flow. However, increased congestio in this area could exacerbate an existing CO problem. This problem also applicable to the No-Build Alternative, although the nature of the problem is different: in redecking, there will be a more serious loss of capacity on the Cen tral Artery viaduct than in the Pre ferred Alternative. On the other hand, the duration of construction significantly less with the No-Buil Alternative.

During the first year of the construction of the Preferred Alter tive, utilities would be relocated disruption of local traffic is anti pated on many of the cross streets. This disruption is expected to rema during the construction of the slur walls. During this time, parts of Surface Artery and Atlantic Avenue will be closed, and extensive detou ing would result. The combined eig lanes of roadway from both the Surf Artery and Atlantic Avenue will be replaced by a six-lane surface road along the length of the Central Artery; also, a 40-foot wide constr tion haul road will be provided in this area. Increased traffic on th viaduct and on local streets such a Summer, Congress, High, Franklin, F eral, and Milk Streets will be over burdened. Adverse impacts on both

one-hour and eight-hour CO concentrations are anticipated as a result of this reduction in capacity and detouring.

Construction of the Central Artery depression is expected to generate significant new truck traffic. For example, up to 1,000 trucks per day could be added to the surface streets during the excavation stage, further affecting local traffic, although a separate haul road will exist under the viaduct to restrict this traffic from the local streets to the extent possible.

A similar effect on local traffic is also applicable to the No-Build Alternative due to capacity restrictions on local streets below the Central Artery, as there will be more of a diversion from the viaduct to the local streets, as well as loss of some lanes of the Surface Artery, during the redecking process. This impact, however, will be offset by the shorter construction time for the No-Build Alternative.

o North End/West End/City Square

There are a number of areas in the North End (Hanover Street, the Callahan Tunnel portal, and Keany Square), the West End (at Leverett Circle), and in City Square (in Charlestown) that are known to have existing eight-hour CO concentrations that are in excess of the 9-ppm standard. Construction of the Central Artery depression or the redecking of the viaduct is expected to aggravate this existing problem. At some point in the construction of the Preferred Alternative for a period of about 12 months, the removal of the southbound Central Artery ramp to Storrow Drive could result in traffic being diverted to Lomasney Way and Causeway Street although a detailed traffic detour route using the Charles River Dam road, Gilmore Bridge, and Rutherford Avenue will be developed. Increased congestion on the local streets could ensue, leading to an exacerbation of the CO problem in this area.

During the construction of ramps and related improvements at Leverett Circle, capacity of the Circle is expected to be reduced by one-third. The Leverett Circle area is presently in violation of the eight-hour CO standard. Reduction in capacity would in essence extend the "peak" hour period in both the morning and evening peaks. This would aggravate the existing eight-hour CO problem.

o South Boston

During the construction of the cross-harbor tunnel, Viaduct-Ramp Street, portions of B and Congress Streets would be closed. These replacements and closures would lead to traffic diversions of other streets, principally in the northern industrial section of South Boston. Because the traffic volumes on these streets are generally not very heavy, no serious congestion and subsequent CO problems are anticipated as a result of this diversion. Potential problems, however, are expected at the various Fort Point Channel bridge crossings.

o East Boston

The construction of the Preferred Alternative is not expected to have any significant adverse traffic effects on the local streets in East Boston. Most of the impact will be felt within Logan Airport. This impact is described in a subsequent section.

Dust Emissions and Exhaust Odor

Dust and truck exhaust emissions at construction sites, staging areas, and along construction haul routes can lead to potential adverse effects (as manifested in nuisance dust, odor, and possible violation of the 24-hour total suspended particulate Federal and State standards). The construction sites along the Central Artery corridor are located in a very urbanized area with extensive public access and with many public amenities, such as Quincy Market and the restaurants along the waterfront.

The potential problems associated with nuisance dust and truck exhaust odor will detract from the enjoyment of these amenities. These problems are equally applicable to both the Preferred and the No-Build Alternatives.

Staging areas in the Central Artery corridor (e.g., at the Anelex Building, or the parking areas by Causeway Street) can lead to increased traffic congestion and subsequent CO problems. These areas would probably be used to varying extents during the construction period. Construction activities at staging areas more remote from the corridor (such as those in the northern industrial portion of South Boston) can lead to nuisance dust problems and particulate standard violation at these locations. With the Preferred Alternative, these potential problems are also anticipated in the Bird Island Flats, the Southwest Terminal, and the Southwest Service areas of the Airport and the residences on the east side of the Jeffries Point community in East Boston.

Final truck routes for all construction-related activities have not been defined as yet, but as plans for a haul road under the existing viaduct from Causeway Street to High Street are included in the project, it would appear that adjacent areas such as the Financial District, the Waterfront, the North End, the West End, the Fort Point Channel, South Bay, and parts of Charlestown and South Boston may be affected by truck exhaust and dust emissions. With the Preferred Alternative, truck emissions could also affect portions of East Boston (e.g., along Route 1A) and some of the businesses within the Airport itself.

Construction at Logan Airport

At Logan Airport, the construction of the tunnel and connecting ramps with the Preferred Alternative is broadly divided into three phases, progressing from the Bird Island Flats area through the Southwest Terminal area to the Southwest Service area.

During the first phase, construction activity is generally lim ted to the southwest corner of Bird Island Flats, although the entire B Access Road will be used for constr- tion access to the staging area at Bird Island Flats. Under certain meteorological conditions (e.g., hi wind and applicable wind directions and without specific dust control measures, some adverse impact assoc ated with high dust loading could b anticipated at the eastern part of Jeffries Point community, and the Southwest Terminal area. The air cargo facilities and other proposed development at Bird Island Flats co also be affected by dust emissions. Aircraft operations at the Southwes Terminal should not be significantl affected by these dust emissions.

The second phase of the construction will extend the tunnel fr Bird Island Flats through the Southwest Terminal area to a point just past the Eastern Air Lines Reservat Center. Impact from dust emissions Jeffries Point will continue to be felt, and might actually intensify because the construction activity would be closer to this community a at the same time the staging area a Bird Island Flats will continue to in use. The frequency of impact fr dust emissions at the Southwest Terminal would be expected to increase, again if specific dust cont measures are not included in the construction specifications. Durin Phase 2, the Eastern Airlines shutt operation and the commuter air line operation at the Southwest Terminal are expected to switch positions. This temporary switch in positions the shuttle and commuter operations could result in a small net reducti of aircraft emissions. However, in terms of ambient concentrations of various pollutants at such sensitiv receptors as Porzio Park and other areas in the Jeffries Point communi this small decrease in emissions is not expected to manifest itself in significant reduction in total poll tant concentrations at these recept locations. The air cargo and other

development facilities at Bird Island Flats will continue to be affected by dust emissions from construction activities.

The third phase of the construction will extend the tunnel from north of the Eastern Airlines Reservation Center to the Airport access road. During this final phase, a number of existing buildings in the Southwest Service area (e.g., the General Aviation Building and the Eastern Air Freight) will be removed. Another staging area will be established and the BIF Access Road will be relocated a little closer to the Jeffries Point community. The potential impact of dust emissions on Jeffries Point would continue to be a problem and the affected area might extend further west into the community. Additionally, most of the facilities in the Southwest Service area (e.g., Sky Chefs, and rental car facilities) and the Hilton Hotel would be affected by dust emissions. During Phase 3, the Eastern shuttle and the commuter operations will again switch back to their original positions in the Southwest Terminal. Impact from these aircraft operations will return to baseline conditions. Impact of dust emissions at the Southwest Terminal and at Bird Island Flats would continue during Phase 3.

Truck movements and other construction-related traffic could potentially interfere with the other normal Airport traffic. If this interference were to result in loss of capacity either on the Airport access or egress roads or the Cross Road, traffic congestion would result leading to potentially excessive CO concentrations at a number of receptor locations at the Airport such as the Hilton Hotel and the East Boston Memorial Stadium. However, construction-related vehicles represent a very small percentage of Logan roadway traffic, and need not cause a breakdown of the Airport roadway system.

Mitigating Measures

The potential for excessively high eight-hour CO concentrations during the construction period is noted in the discussion on construction impacts. For the most part, this potential problem will be alleviated by traffic control measures that will lead to reducing the increased congestion at street intersections and other local roads, or at areas that were estimated to have potentially high CO levels even before construction. In the Central Artery corridor, however, the potential traffic congestion could be so severe that normal traffic control measures may not be adequate to mitigate the potentially severe CO problem. During the construction period, therefore, some other alternative by-pass routes, traffic routing schemes, or disincentive measures may have to be developed to substantially reduce the traffic demand for the overly congested corridor.

The construction haul road has been designed to control the passage of trucks along the Central Artery Corridor, to reduce the effect of this traffic on local roads and to control the potential for dust and related impacts. The six-lane surface roadway will be used to maintain local traffic flow in this area.

Potential CO problems at the Airport will be alleviated by maintaining full capacity on the Airport access and egress roads and the Cross Road, through alternative by-pass routes and/or other traffic management measures.

Dust and accompanying high suspended particulates concentration is a very common and serious problem associated with construction activities, particularly in urban areas. Wetting the exposed earth areas or where practicable, chemically stabilizing these areas, and covering dust-producing materials during transport will be implemented to minimize dust emissions. Control of dust emissions at the Airport during all three phases of construction to mitigate a potentially severe and extended impact within the Airport and at the Jeffries Point community will

also be required by the construction specifications.

Exhaust odor impact from trucks is most effectively controlled by judicious designation of construction haul routes to avoid public amenities (public parks, restaurants), and sensitive receptor locations (residential neighborhoods). Construction haul routes will be further developed during the design phase of the project with input from the public and appropriate agencies to minimize encroachment of construction vehicles into the adjacent neighborhoods.

4.8 NOISE AND VIBRATION

4.8.1 Noise

The future noise effects due to the project and its construction has been assessed by comparing predicted future noise levels at sensitive receptor locations with measured existing noise levels and with FHWA criteria.

The basic noise descriptor used for this analysis is the equivalent noise level (L_{eq}), expressed in decibels (dBA). Refer to Section 3.6.1 for information on noise descriptors, measurements and criteria. Following the summary comparison of alternatives, the noise effects of the No-Build Alternative and the Preferred Alternative are presented.

Comparison of Alternatives

In terms of design year (2010) total traffic noise, the Preferred Alternative would be 4-11 decibels quieter than the No-Build Alternative and Alternatives 2, 3, 4 and 5 for noise sensitive receptors in the vicinity of the existing Central Artery. At Harbor Towers, the Preferred Alternative would also be 6-9 decibels quieter than Alternatives 3A, 5A and 6. In the Fort Point Channel area, the Preferred Alternative would be about 4 decibels quieter than Alternatives 3 and 6 at Museum Wharf, and 4-7 decibels quieter than Alternatives 3, 3A and 6 at the Boston Tea Party Museum. However, the Preferr Alternative would be about 1-2 deci- bels louder than Alternatives 5 and at the Tea Party Museum; a differen of less than 3 decibels is not discernible to the human ear. For all other sensitive receptors in the project area, total traffic noise f the Preferred Alternative would not perceptibly different from any of t other alternatives.

In terms of construction noi the Preferred Alternative would hav adverse impacts that are similar to those for the No-Build Alternative Alternatives 3A, 5A and 6 at noise- sensitive receptors along the exist Central Artery corridor, except the impact for the No-Build Alternative would be of a shorter duration. Construction-period noise impacts during required Central Artery deck replacement with Alternatives 2, 3, and 5 would be the same as with the No-Build Alternative. These same conditions apply to the Charlestown and North Station areas, except tha impacts would be less extensive for the No-Build Alternative. In the F Point Channel area, the Preferred Alternative would result in lesser construction noise impacts at sensi- tive receptors (primarily the Tea Party Museum), than all other buil alternatives because construction further removed from the receptor. the South End, construction noise impacts for the Preferred Alternati would be similar to those for Alter tives 4, 5 and 5A, and would be greater than those for all the othe build alternatives. In South Bosto construction noise impacts for the Preferred Alternative would be simi to those for Alternative 5A, and greater than those for all other alternatives. Finally, in East Boston, there would be no significa construction noise impact for the Preferred Alternative at any reside tial location. Thus, impacts would less than those for all other alter tives with a Third Harbor Tunnel. However, the Preferred Alternative would result in greater constructio noise impact than all other build alternatives at the East Boston

Memorial Stadium.

No-Build Alternative

Future Noise

Estimates of noise for the No-Build Alternative are included here for comparison with existing noise levels and with estimates of both project and non-project noise for the Preferred Alternative.

Future traffic noise was predicted at each of the 18 noise-sensitive receptors (sites 1-4, 8-13 and 15-22A) in the project area (see Figure 18 for identification of these sites; Table 55 identifies the types of land uses and approximate numbers of people represented by these receptors). Receptors include all existing activities, developed lands, and undeveloped lands for which development is planned, designed, and programmed which may be affected by noise from the project. Site 22A (Harbor Tower Condominiums) has replaced site 22 (Harbor Towers Parking Garage) for purposes of noise prediction and impact assessment because it is a noise-sensitive land use. The measured noise level at site 22 (71 dBA L_{eq}) was adjusted (to 69 dBA L_{eq}) at site 22A to reflect the increased distance from the Central Artery (the dominant noise source). The four sites not included in the present analysis (5, 6, 7 and 14) are beyond the area of influence for the Preferred Alternative. Noise predictions were performed in accordance with current FHWA procedures.

Table 56 summarizes predicted design-year (2010) noise levels at each selected site for the No-Build Alternative and the Preferred Alternative. Shown are the traffic noise contributions due to project roads (i.e., roadways constructed or reconstructed by the project), non-project roads, and the total for each site. Also included are the existing measured noise levels, the FHWA Activity Category for each site, and the site's corresponding Noise Abatement Criterion.

Of the 17 sites where existing noise levels have been determined (noise measurements were not made at site 15), two will experience decreases ranging from 2 to 8 decibels (sites 3 and 13); one site will not change (site 12); and the remaining 14 sites will experience increases ranging from 4 to 11 decibels with the No-Build Alternative. As indicated in Section 3.6.1, changes in noise levels are perceptible at approximately a 4-decibel change. Applying this criterion to changes in noise levels for the No-Build Alternative between the present and 2010, perceptible increases will occur at 14 sites (1, 2, 4, 8-11, and 16-22A), while a perceptible decrease will occur at only one site (site 13 - Porzio Park).

Construction Impacts

For the No-Build Alternative, major sources of construction noise will include concrete saws, cranes, trucks and support equipment required for redecking operations. It is anticipated that construction will proceed using two 10-hour shifts per day over a period of three years. Temporary construction-noise effects were assessed by comparing construction noise predictions at sensitive receptor locations with existing noise levels (see Appendix 5).

A review of the planned construction associated with the deck replacement of the Central Artery indicates that, compared to existing noise levels, minor impact (5-10 decibel increase) from construction noise is expected at Charles River Dam Park, the Casa Maria Housing (North End), Waterfront Park, and Harbor Tower. Moderate impact (10-15 decibel increase) is expected at Quincy Market, and substantial impact (greater than 15 decibel increase) is expected at the Stillman Place residences (North End) with the No-Build Alternative.

Mitigating Measures

Since the No-Build Alternative has not been selected as the Preferred

Table 55

RECEPTORS THAT MAY BE AFFECTED BY NOISE FROM THE HIGHWAY

	Site	Activity or Land Use Represented	Approximat No. of People Represente
1.	Rotch Playground	Rotch Playground, closest to Albany Street	-
2.	St. Peter and Paul Church	St. Peter and Paul Church	-
3.	Dockside Condominiums	Dockside Condominiums, Children's Museum and associated open space	80
4.	Boston Tea Party Museum	Boston Tea Party Museum	
8.	Bremen Street residence, 1-1/2 blocks northeast of Porter St.	All Bremen Street residences directly opposite the Airport Access Road	200
9.	Bremen Street residence, 2-1/2 blocks northeast of Porter St.	All Bremen Street residences out of direct line with the Airport Access Road	140
10.	East Boston Memorial Stadium, northwest baseball backstop	Northwest portions of the East Boston Memorial Stadium	-
11.	East Boston Memorial Stadium, southeast baseball backstop	Southeast portions of the East Boston Memorial Stadium	-
12.	Maverick Street residence	All Maverick Street residences between Jeffries and Lamson Sts.	120
13.	Porzio Park	Porzio Park	-
15.	Waterfront Park, Boston	Waterfront Park, near Atlantic Ave.	-
16.	Waterfront Park, Boston	Major portion of Waterfront Park	-
17.	Edward Everett House, City Square, Charlestown	Residences near City Square with a direct view of project roads	200
18.	Charles River Dam Park	Charles River Dam Park	-
19.	Stillman Place Residence, North End	Lower floors of residences along Stillman Place, Cooper Street, and Washington Street south of Thatcher Street, with facades toward the Central Artery	480

Table 55 (Cont'd.)

	Site	Activity or Land Use Represented	Approximate No. of People Represented
20.	Casa Maria Housing, North End	Upper floors of nearby multi-story dwellings within 1 block of and with facades toward the Central Artery but with some shielding by other nearby buildings	340
21.	Quincy Market Mall, Commercial Street at North Market Street	East end of Quincy Market Mall	-
22A.	Harbor Tower Condominiums, Boston	Harbor Tower closest to the Central Artery; condominums with a view of the Central Artery	310

Alternative, measures to mitigate adverse noise impacts are not provided. However, measures applicable to the Preferred Alternative (discussed in a subsequent subsection) could also be applied to the No-Build Alternative, as appropriate.

Preferred Alternative

Future Noise

Potential future noise effects due to the project are related primarily to roadway traffic. Noise impact due to the tunnel ventilation buildings will be avoided by incorporation of adequate noise abatement during facility design, as required to conform with the Boston City Noise Ordinance, and with the guidelines of the Commonwealth of Massachusetts Department of Environmental Quality Enginnering (DEQE) concerning mechanical ventilation equipment.

From Table 56, comparison of the Preferred and the No-Build Alternatives shows that the Preferred Alternative will not be perceptibly louder at any of the sites. In fact, the Preferred Alternative will be perceptibly quieter than the No-Build Alternative at six sites (sites 15, 16, 19, 20, 21, and 22A), by as much as 11 decibels, primarily due to the elimination of traffic on the elevated Central Artery as a noise source.

As indicated in Table 56, there are no locations for the Preferred Alternative with predicted noise-level increases of 15 decibels or greater, when compared to existing noise levels. However, predicted total noise levels exceed the FHWA Noise Abatement Criterion for the particular activity category at 16 out of 18 sensitive receptors, representing a population of about 1,870 residents.

No Category-A sites were identified. Category-B sites include all park, playground and noise-sensitive institutional sites, plus all residences with yard or balcony areas exposed directly to project noise (sites 1, 3, 4, 10, 11, 13, 15-18, and 21). Category-E sites include the Church and those reside tial sites without exterior activit (sites 2, 8, 9, 12, 19, 20, and 22 Impact assessment at the St. Peter Paul Church (site 2) assumed closed windows that provide an outdoor-to-indoor noise reduction of 25 decibels. Interior impact at the Category-E residences (sites, 8, 9, 12, 19, 20, and 22A) assumed open windc that provide an outdoor-to-indoor noise reduction of 10 decibels.

Mitigating Measures

A number of noise-abatement measures have been considered for t project, including traffic manageme alterations of alignment; acquisiti of buffer zones; noise insulation c public-use or non-profit institutic structures; and noise barriers.

Traffic-management. Traffic management measures are sometimes feasible for noise abatement. Prohibition of truck traffic -- especial heavy-truck traffic -- would produc significant noise benefits. In the long-term, however, such prohibitic is not possible for the Third Harbc Tunnel or for the Central Artery, b of which are intended to serve as major routes for delivery of goods Time-use restrictions on truck tra would be similarly impossible in t long-term. During construction, however, heavy construction trucks other heavy construction vehicles be confined to construction haul r and restricted from using local streets to the extent possible.

Lower speed limits would not significantly affect traffic noise because traffic is expected to flo below posted speed limits during pe travel periods due to capacity constraints. To produce further speec reduction would require very low sp limits, and would be essentially impossible to enforce.

Traffic management is not a feasible noise-abatement measure fc this project for long-term noise impacts. As noted above, it is

Site No.*	Description	Daytime Hourly L_{eq} (dBA)** Existing	No-Build Alternative P	No-Build Alternative N	No-Build Alternative TOT	Preferred Alternative P	Preferred Alternative N	Preferred Alternative TOT	FHWA Activity Category	FHWA Noise Abatement Criterion (dBA L_{eq})
1	Rotch Playground	69	–	80	80	81	<65	81	B†	67
2	St. Peter and Paul Church***	38	–	47	47	45	38	46	E††	52
3	Dockside Condominiums	73	–	71	71	65	66	69	B	67
4	Boston Tea Party Museum	65	–	75	75	69	74	75	B	67
8	Bremen St. Residence***	59	–	65	65	51	62	62	E	52
9	Bremen St. Residence***	58	–	65	65	52	61	62	E	52
10	East Boston Mem. Stad.	65	–	69	69	64	66	68	B	67
11	East Boston Mem. Stad.	67	–	72	72	71	60	71	B	67
12	Maverick St. Residence***	54	–	54	54	52	52	55	E	52
13	Porzio Park	69	–	61	61	60	59	63	B	67
15	Waterfront Park, Edge	–	–	81	81	73	57	73	B	67
16	Waterfront Park, 90 ft from Edge	69	–	78	78	70	56	70	B	67
17	Edward Everett House	69	–	78	78	76	68	77	B	67
18	Charles River Dam Park	69	–	79	79	76	65	76	B	67
19	Stillman Place Residence***	62	–	70	70	66	<55	66	E	52
20	Casa Maria Housing***	61	–	70	70	62	<50	62	E	52
21	Quincy Market Mall	71	–	81	81	73	65	74	B	67
22A	Harbor Tower Condominiums***	59	–	69	69	58	<45	58	E	52

*See Fig. 19

** P = Project contribution; N = Non-project contribution; TOT = Total.

***Estimated interior noise levels

†Category B refers to sites with exterior land use, including picnic areas, recreation areas, playgrounds, active sports areas, parks residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.

††Category E refers to sites with interior use only, including residences, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

feasible to reduce construction period noise impacts.

Alteration of alignment. For a proposed new roadway, it is sometimes possible to alter the horizontal alignment to move it further from noise-sensitive receptors. The alignment of the Preferred Alternative has been developed with the intent to reduce noise impact at sensitive receptors, and has produced substantial noise benefits to East Boston. Further changes in alignment must at least triple the distance between receptor and roadway in order to produce additional significant benefits; such shifts in alignment are not feasible (see Section 2.5 DESIGN CONSIDERATIONS FOR THE PREFERRED ALTERNATIVE).

The project's vertical alignment is primarily dictated by the need to connect to existing roadways. Any small changes that remain possible would have no significant effect on noise.

Acquisition of buffer zones. Where unimproved property exists between noise-sensitive receptors and a roadway corridor, acquisition of this property can preempt future development close to the roadway. However, no such opportunities exist along the proposed project alignment.

Noise insulation of public-use or non-profit institutional structures. Noise insulation of public-use or non-profit institutional structures can be incorporated into this project, particularly in the North End areas affected by construction noise. This is primarily a construction noise mitigation measure that will be evaluated further during the design phase.

Noise Insulation for Private Buildings. The Commonwealth is committed to developing a program to help private building owners soundproof structures immediately adjacent to construction areas, through use of double panel windows and air conditioning. As with the public buildings, this is primarily a construction noise mitigation measure which wil evaluated further during the desig phase.

Noise barriers. Noise barri have been evaluated where the total projected noise levels approach or exceed the relevant FHWA Noise Aba ment Criterion. In total, noise barriers have been examined for all sites except 2 and 13. At these tw sites, noise increases are less tha 15 decibels and the total noise doe not approach the Noise Abatement Criterion.

Significant noise reduction five decibels or more is not acoust cally feasible at sites where non-project noise exceeds project noise At such sites, even a complete elim nation of project noise, through noise-barrier design, would reduce total noise by a maximum of three decibels. Unless non-project noise five decibels or more below the tot noise level, noise abatement is considered acoustically not feasib since significant total noise reduc tion is unattainable. For the Preferred Alternative, noise abatement not acoustically feasible at sites 4, 8, 9, 10, 12, and 20. For the remaining sites, where noise barri are acoustically feasible, Table 5 contains the predicted noise level both with and without noise barrie The likelihood of implementing the barriers is discussed below. Fina decisions on their implementation be made during the design phase of project, when neighborhood opinion assessed.

At site 1, where the propose project would increase noise by one decibel, a reduction of 5 decibels could be achieved with a 15-foot hi barrier along the edge of the main highway structure, for a length of approximately 900 feet, plus a 12-f high 1,100-foot long barrier along ramp. The total-noise reduction wo be just five decibels due to traffi noise from surface streets. Becaus of the massiveness and the limited benefit of these barriers, and the limited usage of this playground, i

is unlikely that the barriers will be built to protect this site.

For site 11, noise impacts for the Preferred Alternative would decrease slightly relative to the No-Build Alternative; two figures appear in Table 57 - one for each of the different barrier heights. Mitigation of 5 decibels can be achieved with the 10-foot high, 2,00-foot long barrier shown in Figure 58. With help from the stadium seating, this barrier protects the half of the park closest to the airport tower. Mitigation of 10 decibels can be achieved with a 1-foot high barrier in the same location. It is likely that the 1-foot barrier will be built (outside the existing park limits) to protect this half of the park at an estimated cost of $437,000, subject to community input.

At site 15, where the project would result in a perceptible decrease in noise level relative to the No-Build Alternative, a reduction of approximately 9 decibels can be achieved with a 10- to 12-foot high barrier, approximately 600 feet in length, located along the western edge of Waterfront Park. It is estimated that such a barrier would cost approximately $78,000 and would also provide approximately a 6 decibel reduction at site 16, further into the park. Less mitigation is achieved here because the barrier is not as close to the receptor and because more sound energy travels around the barrier ends. A barrier along this park edge would obstruct access to Waterfront Park and would obstruct the view of the harbor from Quincy Market. For these reasons, this barrier is not likely to be built.

At sites 17 and 18, where the project would result in a slight decrease in noise relative to the No-Build Alternative, reduction of approximately 7 decibels can be achieved with 10- to 15-foot high barriers on all elevated roadways and ramps north of Causeway Street, as well as adjacent to some surface streets. These barriers would reduce project noise by approximately 10 decibels, although the total noise benefit would be just 7 decibels, due to noise from non-project roadways. At this time, construction of such barriers does not appear likely.

For the lower floor of site 19, a reduction of approximately 11 decibels can be achieved with a 15-foot high, 300-foot long barrier along the southern and western edges of relocated Stillman Place (see Figure 58). This residence is typical of a large number of residences and other noise-sensitive land uses along this edge of the Central Artery. Although all residences along the corridor in this area would significantly benefit from a similar barrier, such a barrier would cut off access of these receptors to their local street. For this reason, such an extended barrier is not likely to be built. Since it is effective in reducing noise levels as well as providing protection through isolation to this area of the North End, the more limited barrier intended to protect only site 19 is likely to be built, subject to community input during the design phase of the project. It is estimated that this barrier would cost approximately $57,000 and would benefit approximately 30 residents at this location. A 10 decibel noise reduction can be achieved in the vicinity of the MDC's roadway access to the new Charles River Dam, with a 500-foot long 15-foot high barrier along the easterly edge of the Causeway Street on-ramp (see Figure 58). It is estimated that such a barrier would cost approximately $171,000. Because of the potential for enhancing this area, which may be utilized as passive recreation space by the MDC in the future, construction of this barrier is likely.

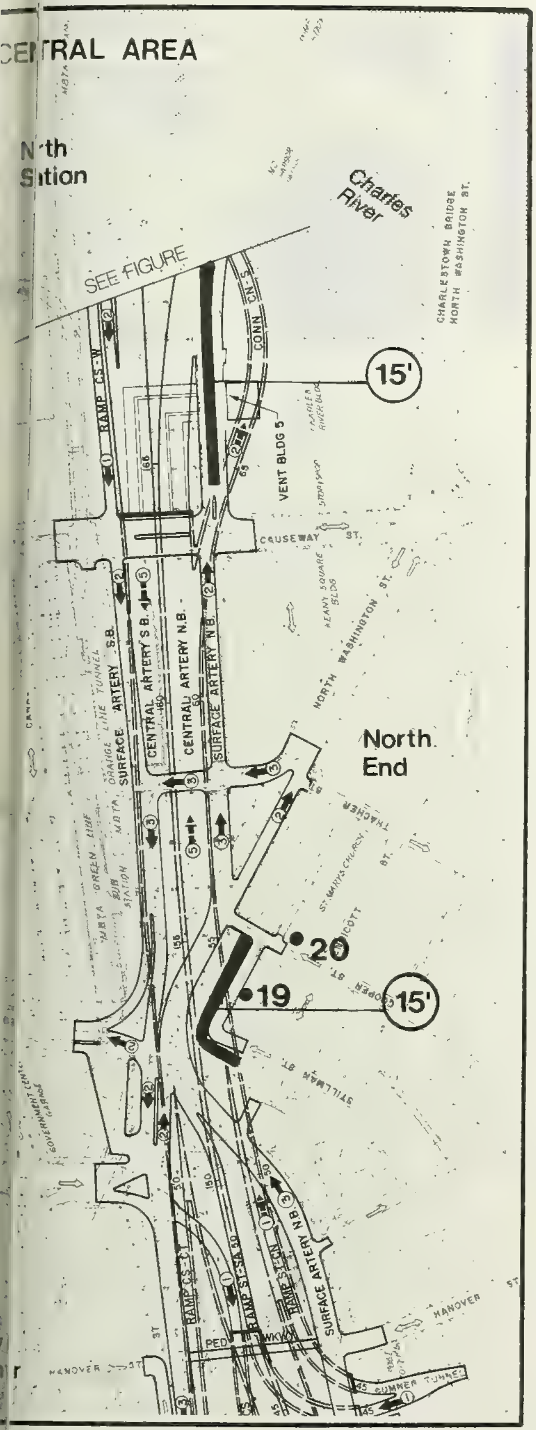
At site 21, a reduction of approximately 10 decibels was calculated with a 10- to 15-foot high, 300-foot long barrier along the western edge of Commercial Street, adjacent to the Quincy Market. This

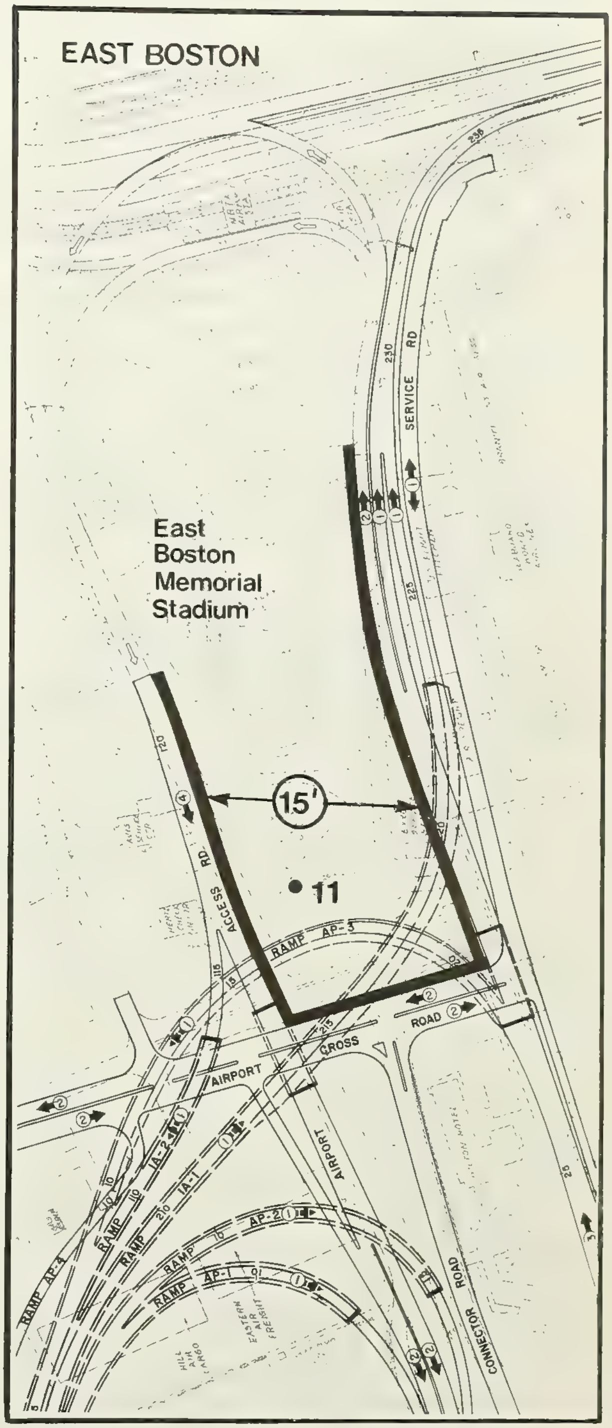
Table 57

BENEFIT FROM NOISE BARRIERS, FOR SITES WHERE NOISE BARRIERS ARE ACOUSTICALLY FEASIBLE*

		Daytime Hourly L_{eq} (dBA)					
			Design-Year (2010)				
Site No.	Description**	Existing	No Barrier	With Barrier	Resulting Mitigation (dB)	FHWA Activity Category††	FHWA Noise Abatement Criterion L_{eq} (dBA)
1	Rotch Playground	69	81	76	5	B	67
11	East Boston Memorial Stadium: the half closest to airport tower	67	71 or*** 71	66 61	5 10	B	67
15	Waterfront Park, Boston: within 50 ft of road	-	73	64	9	B	67
16	Waterfront Park, Boston: between 50 and 200 ft from road	69	70	64	6	B	67
17	Edward Everett House	69	77	70	7	B	67
18	Charles River Dam Park	69	76	69	7	B	67
19	Stillman Place Residence: Lower Floor†	62	66	55	11	E	52
21	Quincy Market Mall	71	74	64	10	B	67
22A	Harbor Tower Condominiums: Lower Floor†	59	58	49	9	E	52

*The likeliness of implementing noise barriers is assessed in the text.





Noise Measurement Location
Noise Barrier
Height of Noise Barrier

Figure 58
Potential Noise Barrier Locations
Central Area and East Boston

0 200 400 Feet

EIS/EIR for I-90 –Third Harbor Tunnel; I-93 – Central Artery

barrier would have cost approximately $45,000 and would have been acoustically effective because it shields not only project noise, but noise from Commercial Street as well. However, a barrier in this location would separate Quincy Market from Commercial Street and would obstruct the view of the harbor. Its intrusion upon Quincy Market would have been severe and thus has been rejected. Fortunately, the Marketplace Center project now under construction will tend to shield the Quincy Market area from noise generated along the Surface Artery. The initial noise analysis for site 21 did not assume the construction of Marketplace Center between the Artery and Commercial Street, at the eastern end of Quincy Market.

At site 22A, a reduction of approximately 9 decibels can be achieved with a 20- to 25-foot high, 300- to 400-foot long barrier along the Surface Artery, wrapping around the Harbor Tower Condominiums at both ends. Such mitigation would accrue only to the lowest residential floor, however. Such a barrier is impractically high and is therefore <u>not</u> likely to be built.

Construction Impacts

For the Preferred Alternative, major sources of construction noise will include pile drivers, jackhammers, trucks, cranes, excavating equipment and miscellaneous support equipment. It is anticipated that construction will proceed using two 10-hour shifts per day over a 12-year period (approximately) in downtown Boston and over a 4-year period (approximately) in East Boston, Charlestown, Fort Point Channel, South Bay, and South Boston areas.

A review of the planned construction indicates that, compared to existing noise levels, minor impact from construction noise is expected at the Edward Everett House (Charlestown), Charles River Dam Park, the Casa Maria Housing (North End), St. Peter and Paul Church, and at the Albany Street Apartments in the South End. Moderate impact is expected at Quincy Market, Waterfront Park, Harbor Tower, Rotch Playground, and at the Boston Tea Party Museum. Substantial impact is expected at the Spaulding Rehabilitation Hospital, Stillman Place Residences (North End), the proposed Arts Building in South Boston, and at the East Boston Memorial Stadium.

Construction Noise Mitigation Measures

Potential mitigation techniques for construction noise include limiting noisy construction activity to daytime hours near noise sensitive areas, to the extent possible; ensuring that all diesel powered equipment has effective mufflers; and erecting temporary noise barriers between noisy construction operations and nearby sensitive receptor locations. The feasibility and effectiveness of the mitigation measures depends upon the specific construction equipment and scenarios planned for the project. Therefore, a project-specific plan to mitigate construction noise will be developed during the design phase, when project-specific construction noise computations can be made. Mitigation will be incorporated as required to conform with the City of Boston Noise Ordinance. In addition, the Commonwealth will explore the feasibility of undertaking a program to soundproof affected private homes in the North End, modeled generally after the programs now being undertaken in East Boston by Massport.

Other noise control options will also be considered. For example, for impact pile driving, include the use of shrouds and exhaust mufflers, or use of alternative methods (e.g., caisson drilling, vibratory pile driving or slurry wall construction). Extensive design efforts must be performed to verify the feasibility of these mitigation measures.

In addition to noise from construction equipment, the potential noise effects associated with the

relocation of aircraft operations at Logan Airport in the vicinity of Eastern Airlines during the early phases of tunnel construction at Bird Island Flats (BIF) have been examined. Potential noise impacts on the Jeffries Point community of East Boston have been assessed qualitatively, based on a review of environmental impact studies for the proposed BIF development and a proposed Eastern Airlines commuter pier.

During the initial phase of project construction at BIF, the commuter airline gate positions will be relocated slightly to the southeast, while a temporary shuttle satellite is being constructed. No change in aircraft noise levels at Jeffries Point is anticipated as a result of this minor relocation.

Following that construction, the commuter airlines will be relocated to the present Eastern Airlines shuttle satellite, and the shuttle aircraft will be relocated to the completed temporary facility near the former commuter satellite. Primarily as a result of altered shielding effects, the relocation might be expected to result in a very slight reduction in daytime aircraft noise at Jeffries Point. In the context of total aircraft ground operation noise, however, there would essentially be no change in the equivalent noise levels at Jeffries Point.

Although the effect of aircraft relocation on noise levels would be minimal, if the Eastern Airlines Reservation Center is removed, this would likely result in a significant increase in noise in some parts of the Jeffries Point community. This would occur since this building forms the northernmost end of the 40-foot high noise barrier provided by the BIF development. Because of this potential impact, and if the Reservation Center is removed, a temporary equivalent noise barrier will be considered, beyond the northernmost end of the BIF buffer zone development, during project construction. (It may be feasible based on further engineering analysis to adjust the tunnel alignment to allow underpinning of this building. Underpinning would allow the building, and its effect as a noise barrier, to remain in place.) Further coordination with Massport and area residents will be required.

4.8.2 Vibration

General

Potential effects of project-related vibration include possible damage to structures, annoyance to people, and disruption of sensitive equipment operation. The severity of these effects is assessed by comparing predicted long-term and construction period vibrations at sensitive receptor locations with existing vibrations and with project vibration criteria. The basic vibration descriptor used for this analysis is the peak vibration velocity, expressed in inches per second (in./sec); refer to Section 3.6.2 Vibration for information on vibration descriptors, measurements and criteria.

The comparison of predicted vibrations with the criteria results in a set of distances from project vibration sources (e.g., road traffic and construction equipment) within which different types of vibration effects (e.g., damage or annoyance) would be expected to occur for various types of buildings or structures. The approximate "vibration impact distances" estimated for this assessment are summarized in Table 58. The estimated number of potentially-affected buildings and structures for this project has been determined by performing an inventory of such structures within the appropriate "impact distances."

As suggested by the impact distances in Table 58, the potential for damage effects could be significant during the construction period due to pile driving and slurry wall excavation. However, "structural damage" (which refers to minor building damage such as breakage of

Table 58

APPROXIMATE VIBRATION IMPACT DISTANCES*

a. **Damage Effects**

Vibration Source	Structural Damage	Architectural Damage: Historic Buildings	Architectural Damage: Non-Historic Buildings
Construction Period			
Pile Driving	6 ft	150 ft	60 ft
Slurry Wall Construction	1 ft	18 ft	8 ft
Long-Term			
Elevated or Rough Roads	**	6 ft	**
Smooth At-Grade Roads	**	**	**
Roadway Tunnels	**	**	**

b. **Annoyance Effects**

Vibration Source	Building Category: Hospital and Critical	Residential/Institutional/Hotel: Wooden Floors	Residential/Institutional/Hotel: Concrete Floors	Office	Factory
Construction Period					
Pile Driving	400 ft	460 ft	330 ft	260 ft	170 ft
Slurry Wall Construction	160 ft	230 ft	80 ft	40 ft	20 ft
Long-Term					
Elevated or Rough Roads	55 ft	130 ft	40 ft	14 ft	7 ft
Smooth At-Grade Roads	13 ft	30 ft	10 ft	**	**
Roadway Tunnels	**	**	**	**	**

*Table entries are approximate distances from the source (in feet) within which vibration impact is estimated to occur. Different distances apply in cases where [illegible] of existing and project vibrations (see text).

plaster, etc.) is likely to occur only in those situations where impact piles will be driven within six feet of a structure or where slurry wall excavation will occur within one foot of a structure. "Architectural damage" (which refers to very fine plaster cracking and the reopening of old cracks) could occur at somewhat greater distances from project construction, particularly for historic buildings. The impact distances for this effect are quite conservative, however, and are based on criteria that make allowance for the cumulative effects of vibration over a period of time. With regard to annoyance effects, Table 58 suggests that impact distances can be considerably greater (e.g., as much as 460 feet for pile driving near residential buildings with wooden floors that may amplify incoming ground vibration).

Potential long-term vibration effects due to the project are related to vibration generated by motor vehicle traffic. As indicated in Table 58, the impact distances for damage effects from road traffic are very small (six feet or less). Thus, it is highly unlikely that traffic vibrations could cause even very minor damage, although such vibration could be annoying to people inside buildings that are very close to roadways. Annoyance would be greatest near roads that are in poor condition and that carry heavy truck traffic. However, since ground vibration has been observed to reach its peak with the passage of an individual vehicle, it has been found that increased traffic volumes do not increase the magnitude of ground vibration, but rather increase the number of peaks that occur in a given time period. Furthermore, it is likely that in the limited situations where traffic vibrations are perceptible, annoyance due to noise (addressed in Section 3.6.1) would greatly overshadow annoyance due to vibration. Therefore, the effects of traffic vibration are assessed based on the maximum amplitude of the vibration rather than on traffic volumes.

Comparison of Alternatives

With regard to potential vibration impacts in the long-term (i.e., from traffic), the Preferred Alternative would have beneficial effects similar to Alternatives 3A, 5A and 6, with reduced levels of vibration as compared to the No-Build Alternative and Alternatives 2, 3, 4 and 5 at locations near the existing Central Artery viaduct. Elsewhere in the project area, long-term vibrations are essentially unchanged over existing conditions, regardless of the alternative.

Potential damage effects of construction vibration are expected to be greater for the Preferred Alternative than for all other alternatives, as summarized in Table 59, since vibrations during construction would affect more buildings than any other alternative. With regard to annoyance from construction vibration, the Preferred Alternative is expected to affect about the same number of residents as for Alternative 6, somewhat less than for Alternatives 2, 3A, 4 and 5A, and considerably more than for the No-Build Alternative and Alternatives 3 and 5 (see Table 60).

By geographic area, the Preferred Alternative would result in impacts similar to Alternatives 3A, 5A and 6 in the Central Area and the area north of Causeway Street. In the Museum Wharf area, construction vibration impacts for the Preferred Alternative would be the same as for all other build alternatives. In the South End, the Preferred Alternative would cause the same construction vibration impacts as for Alternatives 4, 5 and 5A, but would cause greater impacts than for all other alternatives. In South Boston, construction vibration impacts for the Preferred Alternative would be slightly more extensive than for Alternative 5A; no such impacts would occur for any of the other alternatives in this area. Finally, in the East Boston neighborhoods, there would be no significant construction vibration impacts for the

Table 59
POTENTIAL DAMAGE EFFECTS OF
CONSTRUCTION VIBRATION

Type of Effect	No-Build	No. of Buildings Affected by Alternative							
		2	3	3A	4	5	5A	6	Preferred
Structural Damage	0	1	1	3	0	0	3	3	3
Architectural Damage	0	8	5	57	11	8	64	57	69

Table 60
RESIDENTS ANNOYED BY
CONSTRUCTION VIBRATION

Alternative	Approx. No. of Residents
No-Build	0
2	3100
3	460
3A	2800
4	3030
5	390
5A	2840
6	2560
Preferred	2500

Preferred Alternative at any residential location (same as for the No-Build Alternative and Alternative 6); all other alternatives would affect the residential neighborhoods during construction. Construction vibration impacts at the Airport Hilton Hotel would be the same for the Preferred Alternative as for Alternatives 3, 3A, 5 and 5A. Alternatives 2 and 4 would have no effect at this Hotel.

No-Build Alternative

Long-Term Effects

Future vibration impacts for the No-Build Alternative will improve over existing conditions because of deck replacement, roadway surface restoration, and improvements to the expansion joints.

Construction Impacts

Construction period vibration impacts during Central Artery deck replacement for the No-Build Alternative are not expected to be significant compared to existing vibrations because of the type of construction equipment expected to be used (i.e., pavement saws, cranes, trucks, etc., rather than impact devices, pile drivers, and similar equipment).

Preferred Alternative

Long-Term Effects

No adverse long-term (i.e., traffic) vibration effects are anticipated from the Preferred Alternative and, therefore, no long-term mitigating measures are required. In fact, some long-term vibration benefits can be expected after the Central Artery viaduct is dismantled. In particular, at locations near existing Central Artery columns, where traffic vibrations are now perceptible, vibrations are expected to become imperceptible after the Central Artery viaduct is removed.

Construction Impacts

During construction, it is anticipated that some underwater blasting of rock will be required in Boston Harbor. Vibration generated by such blasting could affect nearby land uses, but the potential for impacts would be limited to industrial and commercial areas near the shoreline in South Boston and at Bird Island Flats. Of particular concern in these areas are the effects of blasting on the drydock and sensitive Navy vessel equipment at the General Ship facility in South Boston, and on electronic equipment at the Massachusetts Technology Center at Bird Island Flats. These potential effects will be carefully evaluated during project design when detailed requirements for blasting are developed, and appropriate mitigation measures will be incorporated as required to avoid impacts. Mitigation measures include the use of controlled blasting techniques such as the pre-splitting or line drilling of rock, use of reduced charge weights, and limiting the depth of rock removed per blast. Assessment and mitigation of potential vibration effects for other project construction activities are discussed below.

For the Preferred Alternative, the most prevalent sources of vibration will be pile driving and slurry wall construction, with pile driving being the dominant source. In downtown Boston, exposure to intermittent pile driving will occur over a one to two year period for the support of relocated utilities. In addition, soldier piles will be driven over a period of about one year for site preparation in each construction section, and some sheet piles will also be driven for depressed ramps and the Blue Line subway tunnel crossing in the Central Area. The remainder of construction in the Central Area will primarily involve excavation and slurry wall construction for about 1 to 1-1/2 years in each section. In the Charlestown, South Boston, and East Boston areas of the project, exposure to pile driving vibration is generally expected to occur for periods of two to three months at nearby sensitive locations.

Maximum vibrations during construction along the existing Central Artery corridor are expected by be 3 to 25 times as great as the maximum vibrations measured at Sites E through I (see Table 61). At Site J (Spaulding Rehabilitation Hospital), maximum construction vibrations are not expected to exceed existing maximum vibrations from MBTA commuter rail operations, but would be continuous during pile driving near this location rather than the intermittent vibrations now experienced. The significance of vibration at these and other sites is discussed below.

There is potential for vibration-induced structural damage at the Hanover Street Post Office and Boston Police Academy in the North End during soldier pile driving operations within six feet of these buildings. The potential for structural damage also exists at the Purity Cheese Company building in the North End and the MBTA Orange Line subway tunnel near North Washington Street during slurry wall construction within one foot of these structures. Therefore, during the design phase, appropriate construction management methods will be specified to minimize the possibility of damage of these critical sites. Some of these measures, as described below under Mitigating Measures, include pre-trenching, pre-augering, use of low-displacement piles, controlling sequencing of pile driving, etc.

For tunnel construction across the MBTA Red Line tunnel in Fort Point Channel near the Gillette Company, the potential for vibration-induced structural damage during excavation around the subway tunnel is mitigated by installation of steel ribs on the inside of the tunnel, and by other measures as described below. For construction across the MBTA Red Line tunnel in Fort Point Channel near Summer Street and across the Blue Line tunnel at State Street, vibration levels are not expected to exceed the criterion limit for structural damage (peak velocity of 1.9 in./sec) but are expected to exceed existing vibrations due to train operations (see Table 61). Specific measures to mitiga[te] these possible impacts are descri[bed] later in this section.

In terms of minor architec[tural] damage, analysis estimates indica[te] that the project vibration criter[ion] for this effect (peak velocity of [0.10] in./sec for historic buildings an[d] 0.20 in./sec for non-historic bui[ld]ings) would be exceeded at approx[i]mately 26 residential buildings i[n the] North End, 26 office or commercia[l] buildings in the Central Area, 15 industrial buildings (2 in the No[rth] End, 5 in the South End and 8 in [South] Boston) and at the Boston Garden a[nd] the Children's Museum. Although a maximum ground vibration velocity [of] 0.35 in./sec is expected to occur [at] the Spaulding Rehabilitation Hosp[ital] during nearby pile driving, measu[re]ments indicate a maximum existing level of 0.47 in./sec due to near[by] commuter train traffic. Since exi[st]ing vibrations are greater than th[e] maximum levels expected to occur during pile driving operations, architectural damage effects are n[ot] anticipated at this building from [the] Preferred Alternative.

Temporary annoyance from construction vibration is expecte[d at] approximately 40 three-story resi[den]tial buildings in Charlestown, 52 residential buildings in the Nort[h] End, Harbor Tower, the Dockside Condominiums, the Albany Street Apartments (South End), and the A[...] Building in South Boston (259 A Street). In addition, annoyance effects are anticipated during con[]struction near approximately 40 of[fice] or commercial buildings (primarily [i]n the area between the Dewey Square Tunnel and Causeway Street), 31 industrial buildings (primarily in South Boston and the South End), 8 institutional buildings, 3 hotels, [and] the Spaulding Rehabilitation Hospital. The most severe annoyance [to] residents is expected during pile driving in the North End, with max[imum] vibration velocities inside the nearest residential buildings as h[igh] as 1.0 in./sec, which could be cha[r]acterized as "very unpleasant." A

Table 61

SUMMARY OF MAXIMUM EXISTING AND FUTURE VIBRATIONS

		Maximum Peak Vibration Velocity (in./sec)	
Site.*	**Description**	**Existing and No-Build Alternative**	**Preferred Alternative Construction**
A	Sidewalk outside 144 Bremen St., above the Blue Line Subway Tunnel	0.060	(Not Applicable)
B	Ceiling inside MBTA Red Line Subway Tunnel below Fort Point Channel	0.042	1.900
C	Ceiling inside MBTA Blue Line Subway Tunnel below Porter St. (East Boston)	0.095	(Not Applicable)
D	Floors inside Gillette Company Bldgs. (South Boston)	0.031	0.045
E	Sidewalk outside Bain Bldg. at 394 Atlantic Ave.	0.066	0.200
F	Sidewalk outside bldg. at corner of State St. and Surface Artery	0.056	0.600
G	Sidewalk outside North Market Bldg. at Quincy Market, near corner of Clinton St. and Commercial St.	0.027	0.100
H	Sidewalk outside North End Nursing Home, at building corner nearest Richmond St. and Callahan Tunnel portal	0.040	0.800
I	Sidewalk outside apartment between Nos. 2 & 3 Stillman Pl. on east side of expressway (North End)	0.016	0.400
J	Ground outside new wing of Spaulding Rehabilitation Hospital, approximately 15 feet from nearest North Station railroad track	0.470	0.350

*See Fig. 20

discussed below, measures to mitigate these impacts include use of low-displacement piles, pre-trenching or pre-augering for piles, etc. At the Spaulding Rehabilitation Hospital and at the proposed Arts Building in South Boston, maximum building vibrations during two to three months of nearby sheet pile driving are expected to be as high as 0.2 in./sec, which could be characterized as "unpleasant." At other affected locations, maximum construction vibrations could be characterized as "easily to strongly noticeable." Based on approximate population density, it is estimated that about 2,500 people living in the project area would be disturbed by vibration during some portion of the construction period.

The effects of construction vibration on sensitive equipment operation are of particular concern at the Gillette Company facilities in South Boston. The analysis indicates that vibration from pile driving for the supports of Gillette's temporary extended water intake pipe would exceed maximum existing building vibration at only 2 of 11 sensitive locations. This effect would occur for a period of about one month, with a maximum peak floor vibration velocity of about 0.045 in./sec at the nearest sensitive building location (see Table 61). In addition, building vibrations are expected to be noticeable at the extreme north end of Gillette's facility during pile driving for tunnel construction across Fort Point Channel. It is unlikely that these levels of vibration will affect Gillette's operations.

The U.S. Postal Service has also expressed concern regarding the effects of construction vibration on their computer equipment at the South Postal Annex. However, a comparison of predicted vibration levels with criteria recommended by computer equipment manufacturers indicates that project construction vibration is not likely to affect this equipment, even though such vibration could be perceptible inside the postal facility.

Construction Impact Mitigati
Measures

Mitigation techniques for th above vibration effects include wat jetting and pre-trenching in the ca of sheet piling and pre-augering an the use of low-displacement piles the case of bearing pile driving. Other mitigation measures applicabl to pile driving include controlling the sequence of pile driving, contr ling the rate at which piles are driven and establishing minimum off distances for pile driving near structures. In addition, the subst tution of slurry wall construction sheet pile driving, where possible, could also be an effective mitigati technique. Additional means to avo adverse effects include scheduling construction to minimize sensitive activity interference (e.g., avoidi night time vibration-related constr tion near residences). Appropriate mitigation measures will be include in the construction documents, base on the details of the design. Addi tional details regarding the assess ment and mitigation of construction vibration are contained in Appendix

Specific measures to avoid structural damage to MBTA tunnel facilities and other nearby structu are detailed in the Supportive Engi neering Report. These measures, wh will be incorporated by the project design, include the use of steel ri to strengthen the lining of the Red Line subway tunnel beneath Fort Poi Channel prior to excavation around (2) the use of a resilient cushion between the proposed highway and th existing subway tunnels at location with small clearances between the tunnels, (3) specification of dewat ing procedures during construction as to minimize stress concentration in subway tunnel structures, (4) th use of shorter than normal slurry w segments where these are close to s way tunnels, and (5) the specification of minimum clearances between project slurry walls and subway tun nels. In addition, an instrumentation program will be implemented to

monitor stress and strain inside subway tunnels during nearby construction.

4.9 WATER RESOURCES

4.9.1 Comparison of Alternatives

The No-Build Alternative avoids all impact to water resources. Of the build alternatives evaluated, Alternatives 3, 3A, and 5 result in the largest impact to water resources, principally due to the volume of dredging required in Boston Harbor. Alternatives 2 and 4, which had shorter cross-harbor tunnels, had somewhat less water-related impacts than these alternatives. Alternative 3A results in even less impact to water quality and the Preferred Alternative has the least impact of all cross-harbor tunnel alternatives because of the shortest route across the Harbor. Alternative 6 had the least water-related impact of the build alternatives. None of the alternatives will affect any programmed improvements to sanitary sewers or implementation of the Fort Point Channel or the East Boston combined sewer overflow projects.

4.9.2 No-Build Alternative

There are no impacts on water quality of the Boston Harbor from the No-Build alternative because of the absence of construction within area waterways.

4.9.3 Preferred Alternative

Long-Term Operational Impacts

The Preferred Alternative may contribute to some reduction of pollutants into the Harbor, since the structures will be totally enclosed. Consequently, with the exception of emissions which are dispersed from the ventilation system, other pollutants will be concentrated and contained within the tunnel structures. This contrasts with the present condition, where all pollutants from vehicles on the viaduct are either dispersed laterally or deposited onto the roadway surface and ultimately are carried into the Harbor by the stormwater drainage system.

The Central Artery and Third Harbor Tunnel walls and ceilings will be periodically washed. This will flush accumulated solids and metals into the tunnel drainage system. Some of these solids and metals will settle in sumps within the drainage system, and will therefore result in a net capture of pollutants. Washdown water will be pumped from the drainage system sumps and discharged into the sanitary sewers. (Stormwater from ramps and other open roadways will not be conveyed to the sanitary sewers, but will be discharged to storm drains.) Sedimented solids and metals will periodically be removed from the drainage system sumps and disposed at an approved location. The following percentages of pollutant removal are estimated to be possible through primary sedimentation in the drainage system sump (Table 62).

Table 62

MEDIAN REMOVAL EFFICIENCY OF PRIMARY SEDIMENTATION

Pollutant	Median Percent Removal
Cadmium (total)	7
Chromium (total)	16
Lead	20
Mercury	21
Copper	19
Nickel	6
Zinc	25
Iron	37
Manganese	8
Ammonia	16
TOC	20
COD	19
Suspended Solids	52
BOD_5	28

Source: EPA, 1977.

In addition to this initial removal of pollutants, further water treatment will also be provided. The Metropolitan District Commission (MDC) has indicated that a minimum of oil/

water separation will be necessary before the washdown water is discharged into the sanitary sewers. This separation is to prevent petroleum fractions, flotables, and other solids from entering the wastewater collection system. During the design phase, plans will be developed for containment and control of accidental spills as required by the MDC. MDC's sewer use regulations prohibit the introduction of stormwater runoff to sanitary sewers.

In summary, some minor long-term benefits to water quality of the Inner Harbor should be derived through the reduction of roadway pollutants which presently are discharged to Boston Harbor. These pollutant reductions will result from improved traffic flow and the removal of solids and metals in the tunnel and Central Artery drainage systems.

Impacts to Fort Point Channel

The Preferred Alternative will entail filling a portion of South Bay, with a bulkhead located at Dorchester Avenue and extending along the western edge of Fort Point Channel. This will reduce the tidal water area of Fort Point Channel from approximately 52 acres to approximately 41 acres, a reduction of approximately 21 percent. This reduction in tidal water area will be reflected in a proportional decrease in tidal prism, with the mean tidal prism falling from 21.5 million cubic feet to 17.1 million cubic feet; the spring tidal prism will decrease from 24.9 million cubic feet to 19.8 cubic feet. The tidal excursion for a particle of water beginning at the mouth of the Channel will decrease from approximately 2,100 feet to approximately 1,600 feet as a result of this filling.

Computed average tidal velocities at the Northern Avenue Bridge will decrease very slightly from approximately 0.1 feet per second to approximately 0.06 feet per second. The flushing time for the Channel will increase slightly, from 2.1 tidal cycles (approximately 26 hours) to 2.25 tidal cycles (approximately 2[illegible] hours).

The design of all highway structures in or crossing the Fort Point Channel has minimized fillin[g] the Channel to the extent possible. However, the resulting 21 percent [illegible] of tidal prism will have some long-term impacts on water quality in th[e] Channel. The existing water quali[ty] under storm conditions in the Fort Point Channel were estimated and a[re] shown in Table 63.

Potential impacts from fill[ing] parts of the Fort Point Channel ar[e] shown in Table 64. As shown in th[e] tabulations, most parameters show little, if any, change in concentr[a]tion. Those which show the greate[st] change are bacteria, BOD and COD, [and] solids. None of the increased concentrations are considered major changes to the existing concentrat[ions].

There may be a 15 percent decrease of dissolved oxygen durin[g] storms. The decrease, however, is [not] expected to make the Fort Point Channel any less habitable for mar[ine] life. Water quality standards for bacteria and dissolved oxygen in t[he] Channel are presently violated, an[d] the presence of the new highway facilities will result in slight exacerbations of these conditions. Construction of the Fort Point Cha[nnel] Combined Sewer Overflow (CSO) trea[t]ment facility by the MDC would sig[ni]ficantly improve overall water qua[lity] conditions.

Impacts to Industrial Seawa[ter] Users

Of the 11 users of sea wate[r] listed previously in Table 27, onl[y] [illegible] are close enough to the constructi[on] area to be of concern. These are [the] New England Aquarium and the Gille[tte] Company. The New England Aquarium removes sediment and suspended sol[ids] from the seawater by sedimentation [and] diatomaceous earth filtration. The Aquarium, therefore, is capable of accommodating increased suspended solids in the seawater, although it

Table 63

EXISTING STORM WATER QUALITY
IN THE FORT POINT CHANNEL
(concentrations in mg/l unless otherwise noted)

Total Coliform Bacteria	69.0×10^6/100 ml
Fecal Coliform Bacteria	3.8×10^6/100 ml
Biochemical Oxygen Demand (BOD)	28.1
Total Suspended Solids	84.3
Mercury	0.50
Lead	0.03
Copper	0.05
Zinc	0.05
Cadmium	0.004
Chromium	0.02
Total Organic Carbon	18.5
Chemical Oxygen Demand (COD)	58.3

Table 64

FUTURE WATER QUALITY
IN THE FORT POINT CHANNEL
(concentrations in mg/l unless otherwise noted)

Total Coliform Bacteria	78.9×10^6/100 ml
Fecal Coliform Bacteria	4.4×10^6/100 ml
Biochemical Oxygen Demand (BOD)	32.1
Total Suspended Solids	96.4
Mercury	0.57
Lead	0.04
Copper	0.06
Zinc	0.06
Cadmium	0.004
Chromium	0.02
Total Organic Carbon	21.2
Chemical Oxygen Demand (COD)	66.6

may require additional cleaning of sedimentation tanks and more backwashing of filters during the construction period.

The seawater intakes of Pauls Lobster Company, Neptune Lobster Company, and Harbor Lobster Company on Northern Avenue will be monitored during construction and, if necessary, temporary filters can be installed to assure clear water for the lobster holding tanks. Hook Lobster Company will be displaced by the Preferred Alternative, and therefore will not be present during the construction period.

To maintain the quality of cooling water used at the Gillette facility, a lengthy relocation of the intake was proposed in the DEIS/DEIR. Gillette objected to the relocation because of significantly increased annual costs for maintenance and access difficulties to much of the system which would have been off Gillette property. Additional information has been developed on the hydraulic characteristics of the Fort Point Channel and a series of computations has been conducted to model the limits of water movement on the ebb and flood tides.

The results indicate that, under existing conditions, the Gillette seawater intake is located in the middle of a thermal mixing zone (see Figure 59). That is, Gillette draws water into its plant which it had previously discharged; hence, the intake water for cooling purposes is actually warmer than it should be because of the proximity to the discharge pipes.

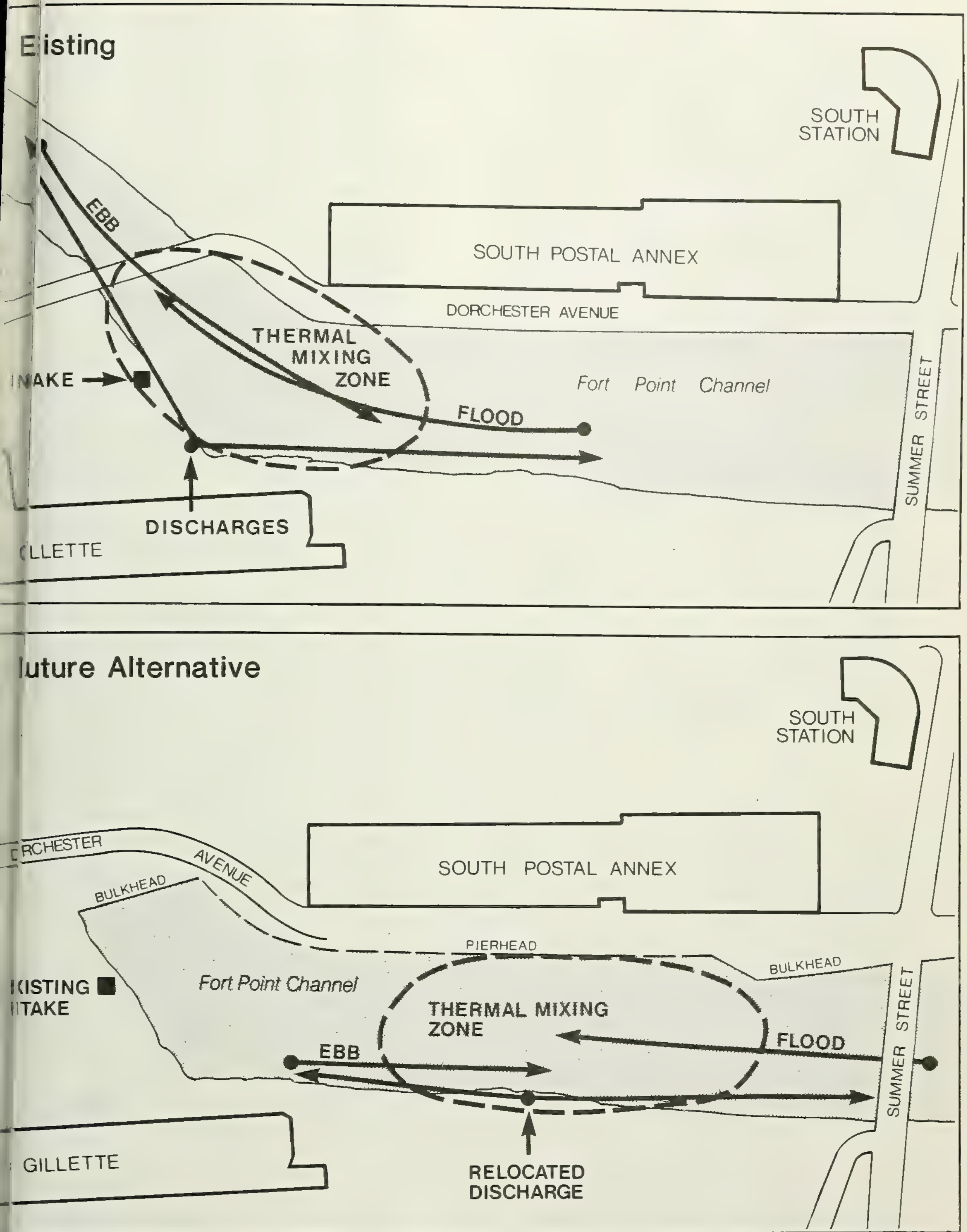
The computations also indicated that filling in South Bay sufficiently reduces the volume of tidal prism such that excursion on the flood tide falls approximately 400 feet short of the existing intake as measured from the northern Gillette property line. That is to say, should the discharges be relocated to the northern property boundary, heated water from the discharge would not reach the intake on the flood tide. Field data also indicated that considerably cooler water (by approximately 4°C) is available at a depth of -11 to -12 feet mean sea level (msl). Therefo the intake could be moved to a loca tion downstream of the discharge if the intake is low enough to allow heated water to be discharged at ar elevation above the cooler water.

The Preferred Alternative wo require that either Gillette's inta or discharges (2) be relocated. Gillette wanted its relocated facil ties to remain on its property so t operational and maintenance costs could be minimized. Plans in the <u>Supportive Engineering Report</u> show permanent relocation of the dischar (also shown in Figure 59), and a temporary relocation of the intake during construction. These are presented as a possible solution to Gillette's cooling water concerns.

However, there are several other alternative measures which co be used to respond to Gillette's cooling water requirements, includi

- Relocating the intake to the north end of Gillette proper
- Relocating the intake to the north end of Gillette proper and relocate the outfall to vicinity of the Dorchester Avenue Bridge or discharge i the Roxbury Canal Conduit.
- Modifying the existing intak or designing a relocated int to tap the cooler water loca at greater depth in the Chan nel, including dredging in t vicinity of the intake and reconstructing the adjacent seawalls, if necessary, and designing any relocated outf to limit vertical mixing.

A preliminary assessment indicates that it is possible to me Gillette's current and future cooli water requirements with various combinations of these measures. Fi selection of the mitigating measure will be made during the design stag



Limits of Tidal Excursion

Figure 59
Existing and Alternative Future Gillette Cooling Water Configuration

0 100 200 400 Feet

of the project, based on detailed hydraulic and thermal analyses to determine thermal capacity of the Fort Point Channel. The mitigating measures will be designed such that Gillette's potential for pumping 57 million gallons per day (mgd) without exceeding the intake and outfall temperature requirements (a maximum of 22.2°C and 28.3°C respectively) will not be reduced. In addition, the mitigation measures will be designed so that expansion of Gillette's cooling water usage would be optimized up to 75 mgd within the current intake and outfall temperature requirements.

An existing 72 inch CSO discharge near the north end of Gillette's property may have an adverse water quality impact on an intake repositioned to this location. Also, the proposed Roxbury Canal Conduit discharge in the vicinity of the Dorchester Avenue Bridge may affect the water quality at the existing intake location. These water quality impacts will also be evaluated during design and will be mitigated by modification or relocation of the discharges, as necessary.

Construction staging will result in initial construction of the South Bay components of the Tunnel and Central Artery stopping short of the Red Line Tunnel. At the same time, construction of the Seaport Access portion of the tunnel will commence approximately 200 feet east of the Red Line Tunnel. After the Seaport Access Tunnel has been completed in the Fort Point Channel, either a temporary or permanent intake will be constructed over the tunnel. This will allow bridging of the Red Line Tunnel, and will require that most of the Channel at that time be blocked by steel sheeting. This sheeting will also result in temporary impacts to recreational navigation in this portion of the Channel.

Construction activities in the Channel will result in temporary increases in turbidity and suspended solids. The construction impact on Gillette's cooling water will be mitigated by use of steel sheeting silt curtains to contain the suspen sediment, temporary or permanent relocation of the intake to the nor end of Gillette property, and by scheduling of construction activiti to minimize the impact at Gillette intake. Specific standards will be established for the quality and vol of the water at Gillette's intake during construction, and an appropri ate monitoring program will be esta lished to ensure that these standards are met.

Impacts to Charles River

The present design of the Preferred Alternative calls for filling 1.68 acres of open waters i the Charles River. However, desig refinements currently underway for this area indicate that it may be possible to minimize these impacts.

Between the new and old Char River dams, approximately 1.18 acre of open water will be filled to construct the Central Artery to Storrow Drive connector ramps. The 1.18 acres represents approximatel percent of the total open water ar between the two dams. The new bul head for the connector ramps will approximately 170 feet from the navigation channel between the dam The relation of the proposed struc and navigational areas is shown on Figure 60. Therefore, there will no impact on navigational use of t Charles River as a result of these structures. Because this area of Charles River is flushed continual as a result of freshwater flow to Boston Harbor, there will be no long-term impact to water quality, fisheries, or hydraulic aspects of Charles River.

An additional 0.5 acres of tidal water will be occupied by th connector ramp below the new dam a as shown on Figure 60. (Design refinements currently underway for this area indicate that it may be possible to move the ramp inland, t eliminating this impact.) This, li wise, will not result in any long-t

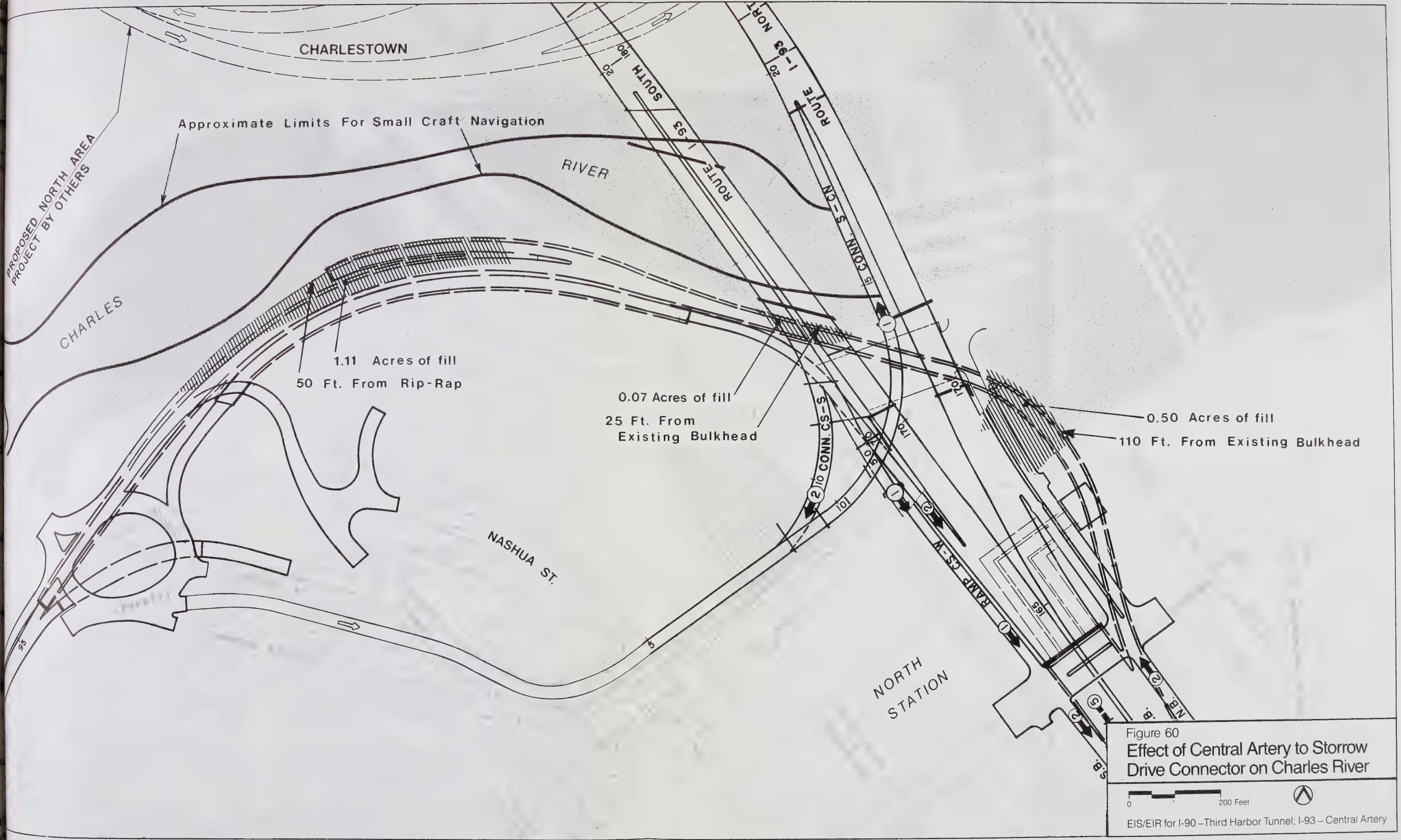


Figure 60
Effect of Central Artery to Storrow Drive Connector on Charles River

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

impacts to water quality or fisheries in the lower basin.

4.9.4 Construction Impacts of the Preferred Alternative

Fort Point Channel

The Preferred Alternative will be constructed within the Fort Point Channel behind steel sheet piling. When the proposed tunnel area has been dewatered and sediment removed, all construction will be in dry conditions. Potential spilling and leakage of dredged sediment from barges and turbulence from tug boats and dewatering of construction areas are the only potential impacts to water quality in the Fort Point Channel. Silt curtains will be deployed in critical areas to minimize water quality degradation in Fort Point Channel, including around discharges of dewatering pumps. A water quality monitoring program will take place during construction in the Channel.

The loss of worms and other benthic fauna inhabiting the sediment in the project area or the loss of fish within these areas is not significant to the overall ecosystem of the Channel or of Boston Harbor. New bulkhead walls will become recolonized following construction, and the only long-term biological impact will result from the small loss of habitat area that will be occupied by the new structures.

Charles River

Construction of the northbound Central Artery/Storrow Drive connector ramp, as presently designed, will displace approximately 500,000 cubic feet of water between the old and new Charles River Dams. Because the highway structure follows the shoreline of the River, and is small relative to available water area and volume (5 percent), this displacement will have no measurable impact on hydraulic performance of the Charles River or Boston Harbor flushing. Below the new Charles River Dam (near North Washington Street), construction of this connector ramp will displace an additional 218,000 cubic feet of tidal water. While this displaceme will occur within tidal waters, it also will have no measurable impact Boston Harbor. (Design refinements currently underway for this area indicate that it may be possible to move the ramp inland, thus eliminat this impact.)

Construction of these connec tors within the Charles River area will take place behind steel sheet piling. Therefore, the only potent impact on water quality will result from spillage and leaking of dredge material from barges, temporary increases of suspended solids from boat and barge movements, and dewat ing of the construction site. Use silt curtains around barges during loading with sediment will restric the dispersion of spilled material. Similarly, use of silt curtains ar discharges of dewatering pumps wil restrict dispersion of suspended solids.

Because construction will t place behind steel sheet walls, th will be no effect on anadromous fi in the Charles River regardless of construction phasing. Design refinements currently underway for this area indicate that it may be possible to move the ramp inland, eliminating construction in the Ri

Boston Harbor

Construction of the Third Harbor Tunnel under the Harbor fro South Boston to Logan Airport will by the sunken tube method. Clamsh dredging for the sunken tube secti will require removal of 490,000 cu yards of marine sediment at a rate approximately 10,000 cubic yards daily. The total time required fo dredging will be approximately 49 working days, which would be sprea over an 8 month period.

As the dredging progresses across the Harbor, a sediment plum will develop on each tide. The pl is defined as the area with a suspended solids concentration 5 mg/l above background levels. As shown

Figure 61, the average width of the plume will be approximately 110 m and will have an average length of 1200 m. Outside a 100 m band nearest the dredge, suspended solids concentrations will decrease to normal ranges for the Inner Harbor. Closer to the dredge, however, suspended solids may reach 600 mg/l and will constitute the most severe water quality impacts of the project and cause some fish mortality.

The dredging operation will also cause an increase in the concentration of sediment-associated contaminants. The elutriate analyses have demonstrated that these contaminants will not occur in solution at high concentrations. However, the contaminants will be present in the water column during active dredging. A conservative estimate of the quantity of these contaminants in suspension with the sediment has been made by assuming that all of the contaminants remain with the suspended sediment at their bulk concentration. The bulk concentration data for the sediments along the alignment of the Preferred Alternative are listed in Table 65 for surface sediments.

Table 65

THE PREFERRED ALTERNATIVE
ASSOCIATED CONTAMINANTS

Average Concentration (mg/kg dry weight)

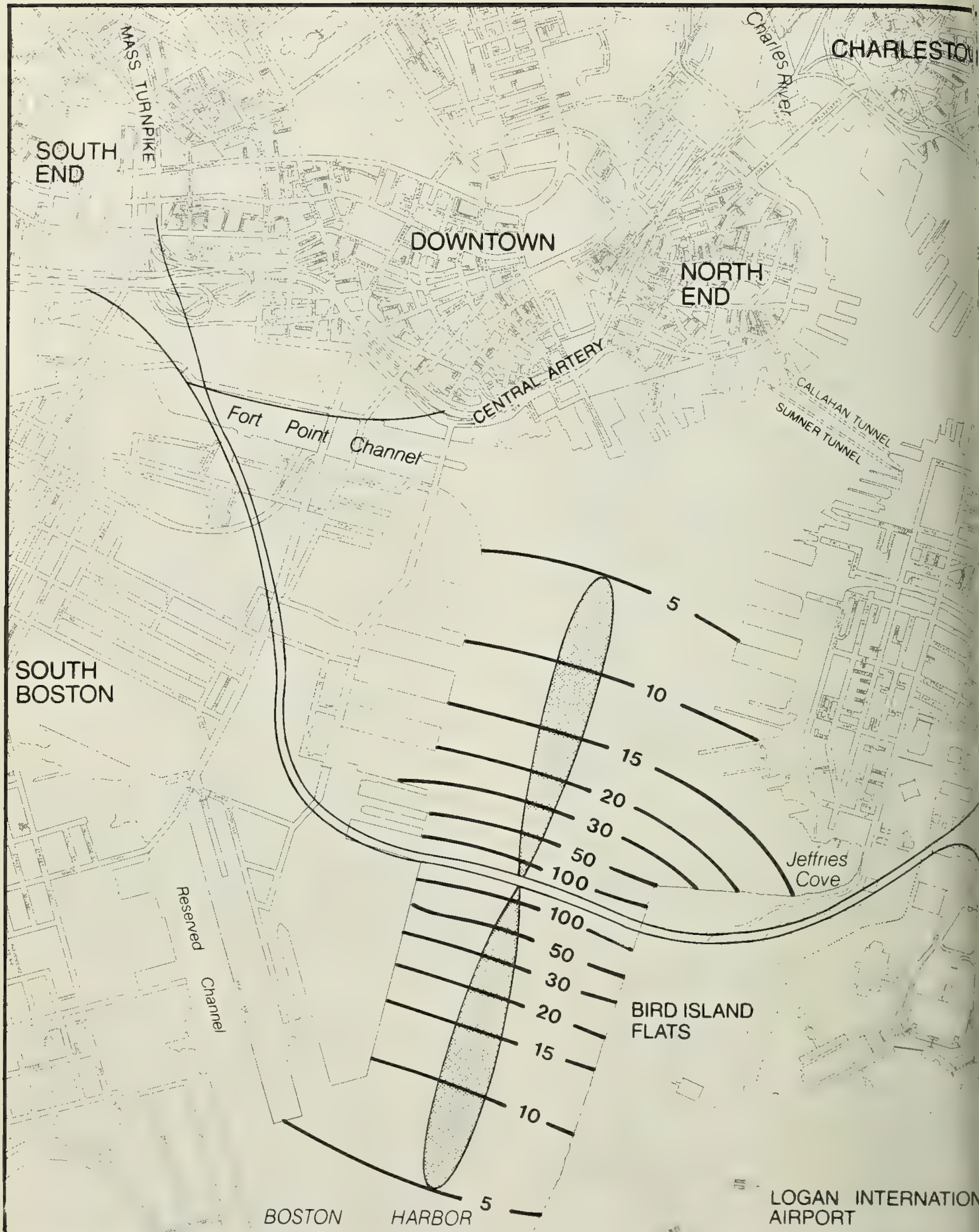
Parameter	Surface Mud
Arsenic	31.00
Cadmium	5.30
Chromium	25.70
Copper	10.40
Lead	45.90
Mercury	0.79
Nickel	1.60
Vanadium	43.00
Zinc	77.70
PCB	0.005
Pesticides	0.005
Total Phosphorus	84.70
Ammonia Nitrogen	60.90
Total Kjeldahl Nitrogen	23.90

Earlier sampling programs in the Harbor have shown that the maximum concentration of contaminants is found in the surface sediments. Since dredging will disturb both the surface and deeper layers of sediment, the surface concentrations listed in Table 65 were used to estimate the maximum concentration of sediment-associated contaminants in the dredging plume.

Table 66 lists the resulting concentrations of sediment-associated contaminants above background at distances from the dredge between 20 m and 1200 m. The concentration of sediment-associated metals in the dredge plume, for the most part, will be in the parts per billion range. The maximum concentrations reported will be those for lead and zinc, exhibiting concentrations of approximately 0.026 and 0.045 mg/l at 20 meters from the dredge. These will be reduced to less than 0.001 mg/l (1 ppb) at the edge of the plume. PCBs and pesticides will not be measurably present in the plume; even at 20 m, the concentration of both will be less than 0.001 mg/l (1 ppb).

There will, however, be higher concentrations of sediment-associated nutrients in the dredging plume. Total phosphorus could reach 0.049 mg/l above background near the dredge. This concentration will be reduced to less than 0.001 mg/l (1 ppb) above background at a distance of 1200 m from the dredge.

These sediment-associated contaminants are not likely to enter the water as dissolved constituents, and thus, will not be present outside the plume or after the plume resettles from the water column. This is confirmed by the elutriate analyses, discussed in Section 3.7 WATER RESOURCES, EXISTING CONDITIONS, which indicate only minor releases of any contaminant, even at high sediment concentrations. Based on these analyses, the concentration of soluble metals, nutrients, and petrochemicals will be 3 to 4 orders of magnitude below the sediment-associated concentrations listed in Table 65.



Typical Plume

—0— Incremental Concentration (Mg/l)

Figure 61

Suspended Sediments

0 900 1800 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Table 66

MAXIMUM CONCENTRATION OF SEDIMENT-ASSOCIATED CONTAMINANTS DURING DREDGING FOR THE PREFERRED ALTERNATIVE
(mg/l)

	Background*	20m**	100m**	300m**	600m**	1200m**
uspended Solids	22	573	106	33	16	5
rsenic	0.001	0.018	0.003	0.001	0.001	0.001
admium	0.009	0.003	0.001	0.001	0.001	0.001
hromium	0.004	0.015	0.003	0.001	0.001	0.001
opper	0.006	0.006	0.001	0.001	0.001	0.001
ead	0.012	0.026	0.005	0.002	0.001	0.001
ercury	0.035	0.001	0.001	0.001	0.001	0.001
ickel	0.016	0.001	0.001	0.001	0.001	0.001
anadium	0.040	0.025	0.005	0.001	0.001	0.001
inc	0.050	0.045	0.008	0.003	0.001	0.001
CBs	--	0.001	0.001	0.001	0.001	0.001
esticides	--	0.001	0.001	0.001	0.001	0.001
otal Phosphorus	0.050	0.049	0.009	0.003	0.001	0.001
mmonia Nitrogen	0.070	0.035	0.006	0.002	0.001	0.001
otal Kjeldahl Nitrogen	1.230	0.014	0.003	0.001	0.001	0.001

*See Table 19

**Concentrations above background

Biological impacts result from the increased suspended solids in the sediment plume closest to the dredge. Impacts include a total loss of benthic bottom dwelling fauna and fish mortality. Recolonization of harbor sediments and new bulkheads will commence the following spring. Thus, no significant long-term biological impacts will result from cross-harbor tunnel construction although short-term impacts will occur during construction.

The marine dredging required for the Preferred Alternative is less than most other Third Harbor Tunnel alternatives. The impacts to water quality from the dredging are limited, similar in every way to a normal maintenance dredging project in the Harbor.

The impacts projected from dredging for the Third Harbor Tunnel can be assessed qualitatively by comparison with other dredge monitoring information. Monitoring during dredging of the Thames River in Connecticut indicated that near field suspended solids impacts were limited to within 150 meters from the dredge. A return to background conditions occurred approximately 1000 meters from the dredge. Additionally, the vertical variation at the dredge was approximately 2 times higher at the River bottom (155 mg/l) than on the surface (68 mg/l). At the point where surface suspended solids were at background concentrations (5 mg/l), bottom suspended solids were 4 times greater.

The previous discussions have referenced a 5 mg/l suspended solids concentration at the end of a turbidity plume. In its "Order of Conditions" to Massport for the South Boston Naval Annex filling, DEQE (July 16, 1980; File No. 6-148) defined a turbidity plume as:

> ". . . A turbidity plume shall be defined as the area in which the effects of solids, suspended in the water column are present in concentrations in excess of 50 mg/l over background values."

With this definition as a guideline, the length of a turbidi plume from the Third Harbor Tunnel dredging will be significantly les than those described. The 50 mg/l concentrations will occur at appro mately 300 meters along either ali ment.

Tunnel construction will require removal of approximately 520,000 cubic yards of rock in the vicinity of the Boston Marine Indu trial Park and General Ship Drydoc South Boston. The necessary blast represents a potential source of adverse environmental effects, inc ing direct mortality of fish and o organisms.

The impact to biota resulti from any underwater blasting progr is a function of several parameter These include: the type and quant of material to be removed; its dep below the water surface and positi ing in relation to the shoreline; bottom configuration; the amount o explosives used; and the type and abundance of organisms in the area

The most vulnerable organis are fish which possess air bladder swim bladders. These fish may rup in response to rapid pressure changes. In general, it has been reported that the effects on fish open water explosions are not prop tional to the size of the charge (Coker and Hollis, 1950). Instead, the most important factors appear be detonation velocity, the speed the pressure pulse, and peak pressure. Peak pressure has also been found (Hubbs and Rechnitzer, 1952) decrease exponentially with increa distance from the explosion. Thus, fish mortality is generally restri to within a few hundred feet of the blast site (Alpin, 1947; Chesapeake Biological Laboratory, 1948; Coker Hollis, 1950; Gowanloch and McDouga 1945). In one study (Brown and Smi 1972), air-bladder fish were suspen

in cages 175 yards from blasting using a series of charges equivalent to 2,?18 pounds of TNT and remained alive and healthy. Small schools of fish were observed in the area two hours after the last explosion.

The impacts of an underwater blasting program can be minimized by a number of mitigation measures. Explosives set in rock or clay produce low level overpressures with reduced lateral or vertical pressure changes. A number of studies (Brown and Smith, 1972; Coker and Hollis, 1950; Falk and Lawrence, 1973; Kearns and Boyd, 1965; Teleki and Chamberlain, 1978) determined that if bore holes are used and the rock is dense, very little energy is transmitted to the water column and the lethal impact zone may be restricted to as little as 150 feet from the blast center, even with fairly large charges of 600 pounds. Submerging charges below the mud line can also buffer the pressure shock wave.

Small warning charges outside of the immediate work area can be used to scare away fish and mobile invertebrates. It has been found (Alpin, 1947; Chesapeake Biological Laboratory, 1948; Coker and Hollis, 1950; Swanloch and McDougall, 1945) that fish mortality declines after the first few detonations, indicating that fish may avoid the detonation zone after a few warning blasts. Blasting can also be scheduled to avoid periods of peak fish migration and spawning.

Blasting for the tunnel is to take place between the Massport fill and the adjacent dry dock. Due to this enclosed area and proximity to major structures, smaller charges will be used (50-100 pounds per detonation). Drilling of shot holes will take place from a drill barge. This, in itself, will keep fish away from the immediate area.

In summary, blasting for rock removal will kill fish and benthic organisms in the immediate area. Lethal effects are not expected to extend beyond a few hundred feet. Peripheral areas which are not altered but which experience benthic mortality will be repopulated quickly, and no significant effect to any fish population is anticipated.

There will be negligible, if any, impacts from tunnel section placement or backfilling. All activities will take place under highly controlled conditions with fill being specifically placed where needed through such methods as the tremie technique.

Lastly, as dredging proceeds across the Harbor, a water quality monitoring program will be conducted to ensure that dredging does not result in widespread water quality problems which may be corrected by a modification in dredging rates.

<u>Odors</u>

Odors will be generated during excavation for structures. The odors will originate from marine sediments and will vary in nature depending on location. Sediments from the Fort Point Channel have a petroleum odor with some sulfide. Sediments in Boston Harbor between South Boston and Bird Island Flats will have a slight sulfide odor. Also, marine sediments buried under all parts of the Central Artery, South Boston, and Bird Island Flats will have a strong sulfide odor at least from the upper organic horizons. Odors will abate as excavation progresses deeper into the marine sediments.

Odors can be controlled in several ways. Although no single odor abatement method will totally control odors, considerable reduction of odors has been reported with use of such oxidants as potassium permanganate, hydrogen peroxide, and sodium hypochlorite (Harrison <u>et al</u>., 1976). Potassium permanganate has been found to work reasonably well in reducing petroleum odors such as kerosene. Experience with pH adjustment on soils exhibiting high sulfide odors suggests adequate odor control can also be obtained with a lime slurry. These materials are ordinarily applied as a

spray or spread dry on the sediments whenever odor becomes a problem.

During the boring program for the design of the project, the location and depths of various odor-producing sediments will be identified to allow development of an adequate odor abatement program for construction. As an additional mitigation measure, staging could be scheduled to excavate strong odor producing horizons at one time. This would eliminate extensive exposure of such layers.

4.9.5 Mitigating Measures

The following mitigation measures will be included for the Preferred Alternative:

- o Oil/water separation in the Third Harbor Tunnel and Depressed Central Artery drainage systems.
- o Optimization of the Gillete cooling water intake and discharge system, with relocation of either or both to be determined during design.
- o Water quality monitoring of Gillette, and other seawater users during construction as well as other areas of Boston Harbor.
- o Deployment of silt curtains in the Fort Point Channel during critical phases of construction.
- o Underwater blasting to be undertaken with use of small charges, bore holes below the mudline, and scheduling to avoid peak fish spawning and migration periods.
- o Application of odor-reducing agents, as necessary, during construction.

4.10 WETLANDS

4.10.1 Comparison of Alternatives

There are no wetlands in the project area as defined by the U.S. Army Corps of Engineers. Using the Commonwealth of Massachusetts' defi tion of wetlands, however, all buil alternatives result in considerable displacement of open water wetlands the Fort Point Channel. Because of the greater length of construction within the Fort Point Channel, Alte natives 2, 3, 3A, 4, and 5 result i greater impacts to open water wetla and displacement of tidal water tha do Alternatives 5A and the Preferre Alternative. The Preferred Alternative produces the least impact to o water wetlands.

4.10.2 Preferred Alternative vs. No-Build Alternative

No federally-regulated wetla occur in the project area. Wetland as defined by State regulation collectively include all lands seaward the 100-year flood line. Consequen ly, areas classified as State wetla incorporate developed and other upl sites, intertidal zones, and such o water areas as Boston Inner Harbor, Fort Point Channel, and the Charles River.

Such areas comprise various types of developed land use, water resources, floodplains, and upland vegetative communities. Accordingl potential impacts resulting from th Preferred Alternative on these subjects are addressed in those respective sections of this report (Secti 4.4, 4.9, 4.11, and 4.12).

The Preferred Alternative wi result in the conversion of the Sou Bay area of Fort Point Channel from open water to a developed use. Thi conversion of approximately 9.1 acr of open water constitutes a long-te impact as well as a loss of open wat wetlands as defined in Massachusett regulations.

Additional impacts to existi open water communities will occur i the remainder of Fort Point Channel. In this area, construction of the Preferred Alternative will result in the loss of approximately 3.9 acres

open water as the northbound Central Artery tunnel crosses over the Red Line Tunnel.

An area totaling approximately 1.18 acres along the southern banks of the Charles River between the old and new Charles River Dams and 0.5 acres in the tidal portion of the Charles River, will also be converted to a developed use. As with South Bay and Fort Point Channel, this conversion constitutes a long-term impact and an irretrievable loss of open water wetlands.

Mitigating Measures

As discussed, the Preferred Alternative will result in no impacts to Federally-regulated wetlands; consequently, no mitigation measures are necessary. With respect to State-regulated wetlands, impacts resulting from construction, and measures to mitigate the impacts have been discussed in Section 4.9 WATER RESOURCES. Also, during the design phase, the requirements of the Wetlands Protection Act (Massachusetts General Laws Chapter 131, Section 40) must also be met. The Boston Conservation Commission will be responsible for imposing specific construction methods and materials to minimize impacts to wetlands through the Order of Conditions; the specifics of these conditions will be incorporated into the construction specifications and the contract drawings.

4.11 FLOODPLAINS

4.11.1 Comparison of Alternatives

There are no significant impacts to floodplains and flooding from any of the alternatives. The Preferred Alternative, however, results in the least impact to floodplains as compared to all build alternatives.

4.11.2 Preferred Alternative vs. No-Build Alternative

Approximately 13 acres of floodplain encroachment will result from construction of the Preferred Alternative within the Fort Point Channel; an additional 1.68 acres of floodplain encroachment within the Charles River will also take place from the Central Artery to Storrow Drive Connector (1.18 acres above the new dam and 0.5 acres in the tidal Charles River).

Flooding in Boston Harbor is controlled almost entirely by a combination of the high tides and storm surges which accompany hurricanes and major winter storms. There will be no impact to flooding because there will be no significant reduction in the cross-section of the Harbor and therefore, its ability to pass flood waters will not be reduced.

The mean sea level water surface area of the Inner Harbor is approximately 54.5 million square feet (upstream of Pier 5, South Boston). The Preferred Alternative will occupy approximately 588,000 square feet in the Fort Point Channel and the tidal portion of the Charles River. This decrease in water plane area is one percent of the existing water plane area, and results in a negligible (uncalculable) rise in floodwater elevation within the Inner Harbor.

Flooding impacts in Fort Point Channel are similarly small. The floodplain encroachment required for the Preferred Alternative will reduce the width of Fort Point Channel to approximately 360 feet at a point approximately 600 feet south of the Congress Street Bridge where the new bulkhead will be located. At Northern Avenue, the existing Channel width will be maintained. For a 100-year storm flow to pass through the reduced cross-section and reduced length of the Channel (3,700 feet), calculations indicate that the elevation increase would be 0.002 feet.

While this represents a calculable increase over the elevation under existing conditions, it is put into appropriate perspective by comparison to the effects of atmospheric pressure changes. One inch of

barometric pressure will result in local sea level changes of up to one foot. The elevation difference resulting with the Preferred Alternative is two-thousandths of one foot. The reason for such an insignificant increase in elevation is that the displacement of flood storage area is spread over an extremely large area.

The reductions in floodplain area associated with the Preferred Alternative will have negligible effects on flooding both in Boston Harbor as a whole, in Fort Point Channel, and in the Charles River. Because the loss of floodplain area and storage volume in the Charles River is immediately above the regulating dam, no provision for compensatory flood storage is necessary.

Mitigating Measures

Since construction of the Preferred Alternative will not create significant adverse floodplain impacts, no mitigation measures are necessary.

4.12 VEGETATION AND WILDLIFE

4.12.1 Comparison of Alternatives

There are no significant adverse impacts to vegetation and wildlife from any of the alternatives.

4.12.2 Vegetation

Preferred Alternative vs. No-Build Alternative

Potential impacts to vegetation from the Preferred Alternative will be minimal. In the vicinity of West Fourth Street and the Broadway Bridge in Boston, small portions of landscaped (City of Boston Maintenance Facility) and successional sites will be affected. A loss of approximately 1.8 acres will occur in this area.

The Preferred Alternative will also result in the disturbance of scattered successional vegetation associated with the railroad tracks in South Boston in the vicinity of Congress Street, Viaduct Street, Summer Street, Ramp Street, and Massport Haul Road. Approximately 4. acres of disturbed successional land will be affected in this area.

Additionally, the Preferred Alternative will result in the loss of approximately 0.4 acres of successional land immediately east of the Charles River Dam, north of Leverett Circle and Nashua Street; the loss of approximately 1.0 acres of open space at Paul Revere Park in Boston; and the temporary loss of approximately 0.25 acres of open space at the East Boston Memorial Stadium. Reconstruction is planned for this latter area as well as the addition of approximately 3 acres of land to the East Boston Memorial Stadium. The Preferred Alternative will result in the loss of approximately 0.6 acres of existing landscaped areas at Logan Airport.

Mitigating Measures

The Preferred Alternative results in insignificant impacts on vegetation in Boston and South Boston and increases the amount of vegetation in East Boston; consequently, no measures to mitigate impacts are necessary.

4.12.3 Wildlife

Preferred Alternative vs. No-Build Alternative

Impacts to wildlife from the Preferred Alternative will be very limited. As indicated in Section 3.10.2, the wildlife habitat potential of vegetative communities in the project area is minimized by their scattered location, relatively small size, proximity to densely developed sites, relatively low diversity of plant species, and the extent to which these areas have been disturbed. Consequently, the minimal loss of vegetation is not expected to affect existing wildlife populations in the overall project area significantly. Effects on aquatic life have been discussed previously in Section 4.9.

Mitigating Measures

No measures to mitigate impacts, other than those discussed in Section 4.9, are necessary because of the insignificant impacts to the wildlife population of the area.

4.12.4 Endangered and Threatened Species

No endangered or threatened species listed at either the Federal or State levels are known to occur in the project area. Their future occurrence in these areas is also highly unlikely. Thus, no impacts to these species are anticipated. No mitigation measures are necessary.

4.13 DREDGED AND EXCAVATED MATERIAL DISPOSAL

4.13.1 Comparison of Alternatives

Alternatives 5A, 3, 3A, and 5 result in the greatest volume of dredging and largest impact to the marine environment, because of the length of the tunnel across the harbor, as shown in Table 67. The shorter subaqueous tunnel portion of the Preferred Alternative results in less impact to water resources and less dredged material to be disposed of all Third Harbor Tunnel alternatives. Alternatives 2 and 4, with the shortest harbor crossing tunnels, involve the least dredging of the build alternatives. The Preferred Alternative results in greater volumes of upland materials to be disposed at landfills, at other upland areas, or at the Foul Area if it were to be redesignated to accept upland materials.

4.13.2 Disposal Alternatives

Alternatives evaluated for disposal of dredged and/or excavated materials included:

(1) Fort Point Channel
(2) Squantum Point
(3) Boston Marine Industrial Park
(4) Lynn Harbor
(5) Logan Airport
(6) Artificial Reefs
(7) Barrier Islands
(8) Quarry Reclamation
(9) Massachusetts Bay Foul Area
(10) Boston Harbor Islands
(11) Landfill Covering

Specific alternatives eliminated from consideration were Fort Point Channel, Squantum Point, Boston Marine Industrial Park, Lynn Harbor, and Logan Airport. Fort Point Channel was eliminated because its filling would obviously conflict with planned and programmed improvements in the area, including the Central Artery/Third Harbor Tunnel project. Filling of shallow water areas at Squantum Point in Quincy was also rejected because of the extensive and productive clam flats that would have been destroyed. Timing of the project is inappropriate for Massport, which needs additional fill for part of its Boston Marine Industrial Park. Filling activities at Logan Airport appear impractical because of the poor engineering characteristics of much of the material to be removed.

Barrier island creation requires clean, sandy material which does not occur in the Third Harbor Tunnel and Central Artery project area, and artificial fishing reefs can only be created with rock. There is no apparent reason to construct fishing reefs or barrier islands in Massachusetts Bay. Reclamation of quarries, such as those at Quincy, is questionable, particularly with marine sediments.

The remaining specific disposal alternatives offer potential for disposal of the materials from the Third Harbor Tunnel and Central Artery. The Massachusetts Bay Foul Area is suitable for the ocean disposal of dredged material. Landfill covering is a possible alternative and is discussed further in this section. Finally, ledge and clean material might be employed in restoration efforts on Spectacle Island in Boston Harbor and will be considered later insofar as timing and volume allow.

4.13.3 Excavation, Reuse, and Disposal Volumes

For the Preferred Alternative, the volumes of materials to be excavated, reused as fill, or disposed have been calculated and are presented in Table 68. These include both marine sediments presently underwater, which will be conventionally dredged (dredged materials), as well as fills on top of old marine sediments (excavate). Wherever possible, suitable materials will be reused as backfill. Most reusable materials are found in the South Boston and Bird Island Flats areas, and stockpiling of suitable materials will take place at those two general locations. Because of poor structural quality, however, much of the excavate which consists of marine sediments will require disposal. Under the present ocean disposal regulations, only material that is dredged from navigable waters can be disposed at the Massachusetts Bay Foul Area (see Figure 62).

In addition to disposal of clays and other materials excavated along the Central Artery and in South Boston and East Boston, approximately 300,000 cubic yards of bentonite slurry (from the slurry wall construction) will also require disposal. Before bentonite slurry can be accepted at a landfill, it must have a solids content greater than 20 percent by weight. After some solidification, the slurry can be transported by truck to any of the nearby landfills.

4.13.4 Agency Coordination

The regulations for ocean disposal of waste materials were reviewed at a series of meetings with the U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (COE), and the U.S. Department of the Interior, Fish and Wildlife Service (FWS). Discussions addressed both excavate and marine dredged materials from the Third Harbor Tunnel and Central Artery construction. Because the Massachusetts Bay Foul Area is designated by EPA for disposal of dredged materia only, other materials, including fi and marine sediments now buried und Boston, or demolition debris, may n be dumped there.

Redesignation of the Foul Ar was also considered. Under the oce dumping regulations and criteria (Federal Register: January 11, 197 Part VI), a modification in disposa site use (Section 228.11) can be considered by EPA after the disposa impacts have been evaluated. Secti 228.4 of the same regulations provi for the designation of a new site f disposal after the necessary baseli inventories and impact assessments have been conducted. A key criteri for redesignation or modification o the Foul Area is the need for such action. In order to determine the need for ocean disposal of excavate material, an evaluation was conduct to assess potential landfills or alternative sites which may be suit able to accept the materials, as previously discussed.

In consultation with the Commonwealth of Massachusetts Department of Environmental Quality Engineering (DEQE), several operational requirements of the solid waste regulations were noted as well as several criteria for selecting line and capping materials. The solid waste regulations require that a landfill must be capped with one fo of clay whenever the landfill is to closed or remains unused for more t one month. Any lateral expansion o landfills within the State also requires that a liner (preferably constructed of clay materials) be placed. There is also a daily requirement to cover compacted refuse. These three requirements for relativ ly impermeable material establish a potential need for marine sediments and bentonite.

Consultation also took place with the Southeast and Northeast Regional Offices of DEQE. The Southeast Region has significantly more landfills (because of the lack of regional resource recovery faciliti

Table 67

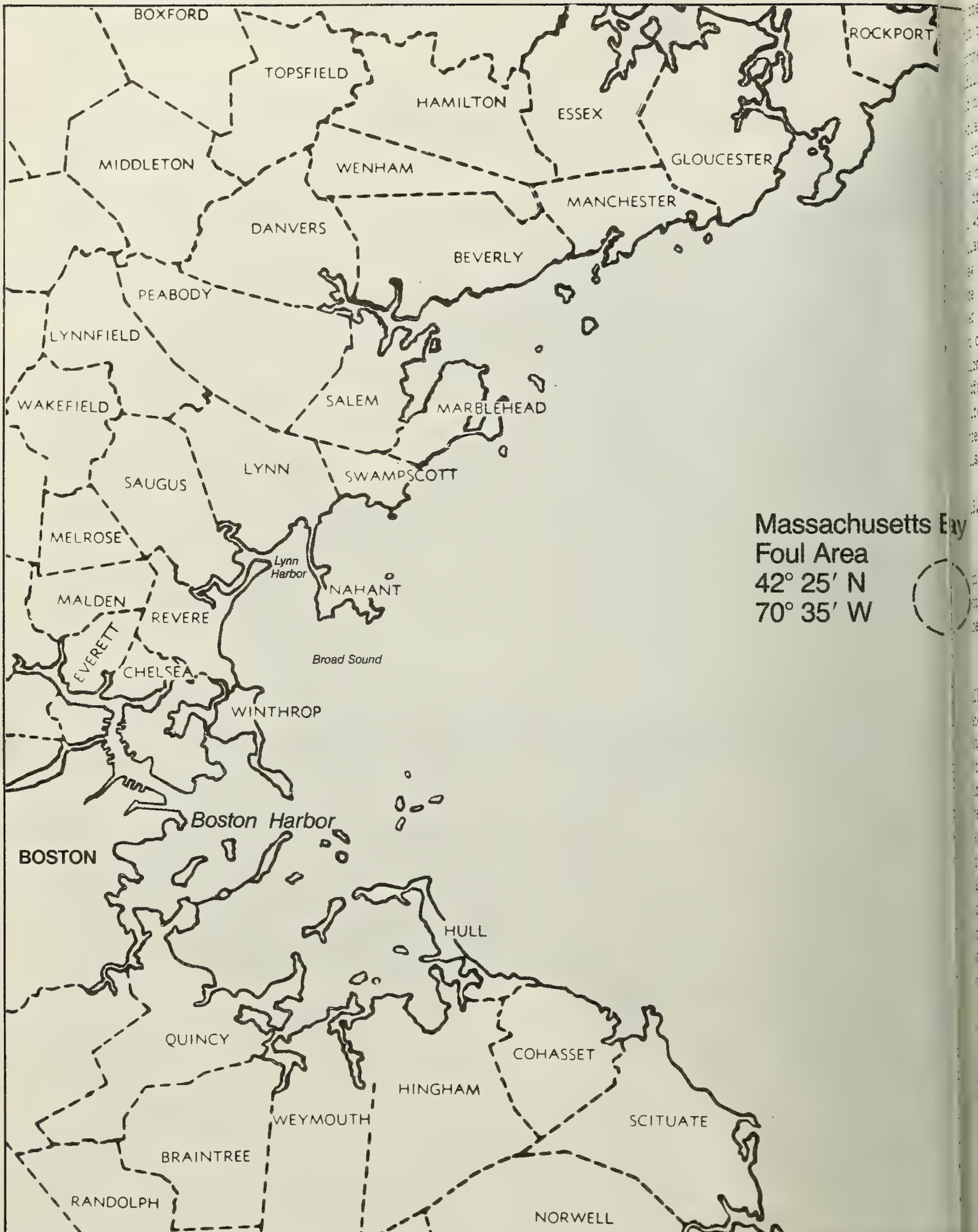
COMPARISON OF EXCAVATION, DREDGING, AND DISPOSAL REQUIREMENTS
(cubic yards)

Alternative	Excavated	Dredged	Disposed	Reused
2	--	2,100,000	2,100,000	--
3	--	2,737,000	2,737,000	--
3A	2,568,000	2,737,000	5,305,000	--
4	--	2,100,000	2,100,000	--
5	--	2,700,000	2,700,000	--
5A	3,335,000	3,340,000	6,675,000	--
ref. Alt.	5,525,000	2,307,000	7,162,000	670,000
6	2,723,000	240,000	2,963,000	--

Table 68

MATERIALS TO BE EXCAVATED, DREDGED, REUSED, AND DISPOSED
(cubic yards)

Source	Mass Materials	Reused	Disposed
South Bay Excavate	1,297,000	181,000	1,116,000
South Boston Excavate	1,582,000	396,000	1,186,000
North Area Excavate	458,000	--	458,000
East Boston Excavate	1,430,000	93,000	1,337,000
Central Area Excavate	2,055,000	--	2,055,000
Boston Harbor Sediment Dredging	490,000	--	490,000
Boston Harbor Rock Excavation	520,000	--	520,000
Bentonite Slurry	300,000	--	300,000
TOTAL	8,132,000	670,000	7,462,000



Foul Area Diameter = 2 Nautical Miles.

Figure 62
Potential Offshore Dredge Disposal Site

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

than does the Northeast Region. Within the Southeast Region, there are 11 commercial and 58 town-operated landfill operations, all of which could have need for clay and other material. Additional uses of the clay also include several eastern Massachusetts hazardous waste sites. Within the Northeast Region, it was estimated that when excavate starts to become available in 1987, there will only be a few active landfills. Therefore, there is greater need for clay and other materials in the southeastern part of the State. Between both Regions, there are approximately six landfills close enough to the marine environment where bulk chloride concentrations in the disposal materials is not a major concern.

4.13.5 Sediment Quality Requirements

The likely characteristics of both upland and dredged marine sediments excavate for the Preferred Alternative have been determined.

Materials to be used at landfills must be relatively uncontaminated. Marine sediments which are not contaminated also pose a threat to ground and surface water quality through the leaching of chloride. Therefore, DEQE requires that marine sediments have a bulk chloride content of less than 250 ppm (the drinking water standard) if the sediments are to be used at an inland landfill. This requirement is particularly important in the Southeast region where the Sole Source Aquifer designation requires careful review of potential impacts by EPA. The bulk chloride requirement is less restrictive for landfills draining to a marine environment. The overall metallic and organic requirements, however, are still imposed. These requirements, therefore, limit the potential locations where marine sediments (or Central Artery materials) can be disposed.

In order to estimate likely restraints on upland disposal of Central Artery and other excavated material, estimates were made on bulk chloride content of the marine sediments buried under the City. This estimation made use of existing data on fill and marine sediments under Section 1 of the Southwest Corridor Project, generally under Back Bay. Within Section 1, there are 15 borings where resistivity and chloride were analyzed on bulk sediments. A correlation analysis was conducted on these data and bulk chloride content was projected to other sediments for which only resistivity was available. The results of these estimates suggest that the fill over marine sediments could have an average bulk chloride content of 170 ppm (range 40-520 ppm), and the native marine sediments could have an average bulk chloride content of 1,900 ppm (range 270-4,800 ppm). If these data for Back Bay are reasonably indicative of conditions under the Central Artery and other locations in South Boston and East Boston, the materials from the Preferred Alternative could only be taken to coastal landfills. There are no similar data on metallic content of these materials.

Sediments to be dredged from the Fort Point Channel were tested for toxicity and bioaccumulation potential. The results of the bioassays indicated that the sediments do not contribute to significant levels of toxicity or bioaccumulation and therefore are suitable for ocean disposal at the Massachusetts Bay Foul Area.

Harbor sediments from the C Street bulkhead (South Boston) to Bird Island Flats have not been tested for toxicity or bioaccumulation. However, reasonable projections of acceptability for ocean disposal can be made from existing data. Bioassay and bioaccumulation testing for several Third Harbor Tunnel alternatives evaluated in the DEIS/DEIR indicated that those sediments were acceptable for ocean disposal. Additionally, Massport conducted bioassay and bioaccumulation tests on sediments off the North Jetty at the Boston Marine Industrial Park (approximately 1,500 feet from the alignment of the Preferred Alternative) as well as along

the Bird Island Flats embankment in Jeffries Cove. The results of those analyses also indicated the sediments could be disposed at the Foul Area. Further corroboration can be obtained from the results of the EPA tests (Nolan, 1980) in which Boston Harbor shipping channel sediments across this alignment were tested and again found suitable for ocean disposal. While there is little reason to suspect the sediments along this alignment will not pass such tests, the sediments will be suitably tested during the design phase of the project. Ocean disposal is assumed for all marine sediment and most rock removed for the Third Harbor Tunnel.

4.13.6 <u>Summary</u>

An analysis of available alternatives for disposal of spoil materials from Boston Harbor and upland excavation sites has been conducted. For materials dredged from Boston Harbor, disposal at the Massachusetts Bay Foul Area is the preferred disposal alternative. It is recognized, however, that use of clean clays is possible at coastal landfills and partial use of these materials is not being ruled out from future consideration. Additional analyses, specifically bioassay and bioaccumulation tests on marine sediments from the South Boston C Street bulkhead to Bird Island Flats, are required and will be conducted during design. As previously stated, however, all indications strongly suggest suitability of these sediments for ocean disposal.

Existing ocean disposal regulations do not permit disposal of excavated spoil from upland areas at the Foul Area. Based on the foregoing assessments, it can be assumed that need for landfill cover exists. However, before any commitment can be made, the materials must be tested for chemical composition and agreements reached with landfill owners to receive material when it becomes available. During design, all suitable landfills will be identified and agreements sought with the landowners and the State to allow the clay excavate to be used for landfill capping if it is found suitable for that purpose.

Ocean disposal of upland spoil may also be pursued through redesignation of the Foul Area during design. This is considered necessary in the event that part or all of the upland excavate is unsuitable for landfills (or no areas are available at the time of construction). Bioassay and bioaccumulation tests and necessary documentation with EPA would also be conducted at that time.

A third disposal alternative which is still under consideration and will be continued through design is the reuse of excavate at Spectacle Island. Master planning efforts are underway for improvements to the Boston Harbor Islands; the need for suitable fill materials is being evaluated at this island as part of these efforts.

Finally, combinations of the above disposal alternatives must also be considered. It is possible that some spoils will not be suitable for any beneficial use or ocean disposal and, due to chemical complexity, must be disposed at a secure site. Other more natural materials will be put to a beneficial use. As future data become available, coordination will continue with DEQE, EPA, COE, and FWS. Section 4.1.4 indicated the methods for transport of dredged and excavated materials.

4.14 HISTORICAL AND ARCHAEOLOGICAL IMPACTS

4.14.1 <u>Comparison of Alternatives</u>

o Alternatives 3A, 5A, and 6, and the Preferred Alternative would require a minor taking in the Charles River Basin Historic District; Alternatives 2, 3, 4 and 5 and the No-Build Alternative would not affect this district.

o Alternatives 3A, 5A, and 6, and the Preferred Alternative, would

nclude reestablishment of the visual elationship between downtown historic roperties, reduction of traffic in istoric areas and improvement of ehicular and pedestrian access to istoric properties. With Alternaives 2, 3, 4, and 5, and the No-Build lternative, existing negative effects f the Central Artery viaduct and raffic congestion on historic reources would continue.

) Alternatives 3A, 5A, and 6, and he Preferred Alternative, would ecessitate taking the Charles River uilding (design modification work now nderway suggests that a ramp redesign in the area may obviate the need to take this building) and modifying the loading facilities at the Stop and Shop Bakery Building in the Causeway - North Washington Streets District; Alternatives 2, 3, 4 and 5 and the No-Build Alternative would not require takings in this district.

o Adverse effects on the Fort Point Channel District are less extensive under the Preferred Alternative than under Alternatives 2, 3, 3A, 4, 5, or 6; the Preferred Alternative places less structure in the Channel, but fills more of the South Bay portion of the district than the other alternatives listed above. New Dorchester Avenue will have fewer lanes with the Preferred Alternative than with Alternatives 2, 3, 3A, 4, 5 or 6. New Dorchester Avenue could also be narrowed to two northbound lanes in Alternatives 3A, 4, 5 and 6, but traffic congestion would become unacceptable; these alternatives do not provide the same alternate routes (via ramp connections to Summer Street) as does the Preferred Alternative. Alternative 5A is similar to the Preferred Alternative in the South Bay area, but does not include a new Dorchester Avenue. The impacts of Alternative 5A in the Fort Point Channel would therefore be less than those for the Preferred Alternative; however, the need for new Dorchester Avenue has been demonstrated in Section 2.5.2 Other Design Considerations. Also, see Section 5.2.3 Fort Point Channel District in Chapter 5.0 SECTION 4(f) EVALUATION. The No-Build Alternative would not have any adverse effects on the Fort Point Channel District.

o Potential adverse effects on downtown historic properties from development of joint development parcels would be similar for Alternatives 3A, 5A, 6, and the Preferred Alternative. Alternatives 2, 3, 4 and 5 and the No-Build Alternative would not create joint development parcels adjacent to the downtown Historic Districts, so there would be no potential adverse effects.

o Potential construction-period adverse effects on historic properties would be greater from Alternatives 3A, 5A, 6, and the Preferred Alternative than from Alternatives 2, 3, 4 and 5 because of the large number of historic properties immediately adjacent to the construction zone. The No-Build Alternative would have some construction-period adverse effects on historic properties, during redecking of the existing Central Artery.

o Alternatives 3A, 5A and 6, and the Preferred Alternative, which include a large downtown project area, would have greater potential adverse effects on archaeological resources than would Alternatives 2, 3, 4 and 5 and the No-Build Alternative. The Phase I, Step 1 archaeological survey indicates that a number of significant sites may exist in the downtown project area; actual impacts cannot be evaluated until the Phase I, Step 2/Phase II Archaeological survey is completed during the next design phase.

4.14.2 Effects on Historic Properties

Effects of the Preferred Alternative on historic resources identified in Section 3.11 are evaluated below. Criteria of effect for historic properties have been established by the Advisory Council on Historic Preservation, which has responsibility for review under Section 106 of the National Historic Preservation Act; they include direct impacts to the property, loss of

access, separation from the context which contributes to its significance, and adverse changes in the property's visual or audible environment.

Section 106 review has involved consultation between FHWA, MDPW, EOTC, the Massachusetts State Historic Preservation Officer (SHPO) and the Boston Landmarks Commission (BLC). Determinations of potential eligibility for the National Register of Historic Places for the properties discussed below were made by concurrence of the State Historic Preservation Officer (SHPO) and the FHWA. The SHPO concurred in FHWA's finding of No Effect on several properties listed below, and a Preliminary Case Report was written to document potential adverse effects on other properties. Based on this Report, agreement was reached on the potential adverse effects and appropriate mitigating measures. A Memorandum of Agreement (MOA), detailing these mitigating measures, has been prepared, and signed by FHWA, MDPW, MHC, BLC, and the Advisory Council on Historic Preservation (see COMMENTS AND COORDINATION section of the report for copies of these).

Properties and Districts not Affected by the Preferred Alternative

It has been determined that the Preferred Alternative will have no effect on the following properties and districts identified in Section 3.11. The SHPO has concurred with FHWA's Finding of No Effect on these properties (see letter dated 7 September 1983 in COMMENTS AND COORDINATION):

1. Charles River Basin District
2. Bulfinch Triangle District
4. Cornhill District
5. Exchange District
7. Commercial Palace District
8. Essex-Kingston Textile District
9. Chinatown District
10. Old West Church, 131 Cambridge Street, 1806
11. First Harrison Gray Otis House, 141 Cambridge Streeet, 1796
12. Boston City Hall, One City Hall Plaza, 1961-68
15. Old State House, 208 Washing[ton] Street, 1712-13
16. Carter/Winthrop Building, 276-278 Washington Street, [1]9[...]
17. (Former) Federal Reserve Ba[nk], 22-24 Pearl Street, 1922
18. 272-276 Franklin Street, 18[...]
20. United Shoe Machinery Corpo[ra]tion, 34-66 High Street, 19[...]
23. Old Waterfront District
26. Leather District
28. South Station Headhouse, 620-290 Atlantic Avenue, 18[...]
30. Commonwealth Pier, 1914
31. Fish Pier (1914)
32. South End National Register District (Nineteenth Centur[y])
34. Butler Aviation Hangar (1930's), Logan Airport

Properties and Districts Adversely Affected by the Preferred Alternat[ive]

Downtown Boston and the North End

Owing to the large number o[f] historic districts and properties [i]n the downtown portion of the projec[t] area, adverse effects that apply t[o] many properties in the downtown project area are described general[ly] in the subsections immediately bel[ow]; these effects and appropriate miti[gat]ing measures are also detailed in [the] Preliminary Case Report. Specific effects to individual districts or properties are then described in t[he] following subsections.

General Long-Term Effects

The effects of depressing t[he] Central Artery on downtown Boston'[s] historic properties are best understood in relation to the existing condition. When it was built, the existing Central Artery cut throug[h] the oldest and most densely built [are]a of downtown Boston, which, because [of] its wealth and central location, h[a]d the highest concentration of archi[te]cturally significant buildings and historic sites. In addition to th[e] many buildings which were demolish[e]d, the combination of an elevated hig[hwa]y together with a multi-lane surface artery beneath it had a major adve[rse] effect on historic properties, cre[a]-

ng a serious blighting effect on the emaining buildings immediately djacent to them and a significant arrier between historically contiguus areas. In recent years, the enewed vitality of some of these reas has begun to overcome these ffects, but the effects are still erious. This is the situation which ill be perpetuated as the long-term effect of the No-Build Alternative.

The significance of the long-term effects of the Preferred Alternative on the historic properties in downtown Boston will be comparable to that of the original Central Artery, but in this case many of the effects will be positive.

Visual Relationship Between Historic Properties. The greatest positive long-term effect of depressing the Central Artery will be to reestablish the visual relationship between the historic areas on either side; e.g., between Quincy Market and the Waterfront, and between the North End and the Blackstone Block. In order to maximize this positive effect, however, appropriate aesthetic mitigation and joint development measures will be be implemented (see the discussion below under General Long-Term Mitigating Measures).

Access to Historic Properties. Another significant long-term effect of the Preferred Alternative on historic properties in downtown Boston will be improved vehicular and pedestrian access. For many of these historic properties, including both tourist-supported and commercial buildings, ease of access is directly related to economic viability, and that in turn is directly related to the ultimate preservation of the resource. Vehicular access is important, but in many cases pedestrian access is even more so, as the narrow streets and small scale of the area make Boston tourism a pedestrian exercise.

Reduced Traffic in Historic Areas. In addition to simplifying access to these areas and the individual resources within them, reduced traffic congestion with the Preferred Alternative will lead to decreased noise and air pollution affecting persons using or viewing these historic properties. Because current and projected traffic volumes under the No-Build Alternative are heavy on nearly all streets in the downtown project area, traffic impacts are a source of adverse effect with the No-Build Alternative.

Joint Development. There are several potential effects from the development of air rights parcels and the creation of ventilation structures and new surface streets by the Preferred Alternative. Future development could help to rejoin adjacent neighborhoods with complementary building styles and land uses. However, the potential also exists for these future developments and street improvements to isolate or inappropriately alter the setting of these properties or to introduce inappropriate visual, audible and atmospheric elements such as new buildings out of scale with the historic buildings and districts or traffic on new streets. The actual effect for each property will depend on the design of street improvements and joint development parcel configurations and the application of appropriate design guidelines for massing, height, and surface treatment of ventilation buildings and subsequent joint development buildings. Measures to minimize potential adverse effects and to maximize beneficial effects are included in the Section 106 Memorandum of Agreement and are described below.

Except where specifically noted to the contrary in the sections below, appropriate mitigating measures can eliminate adverse effects. As stated in the Section 106 Memorandum of Agreement, FHWA will ensure that potential adverse effects from the use of air-rights and other joint development ventures, the development of ventilation structures, and surface street improvements on historic properties described in FHWA's Preliminary Case Report will be minimized or

avoided through appropriate design. Design guidelines will be developed by the Massachusetts Department of Public Works, in consultation with the Massachusetts SHPO, BLC, and other interested groups, for joint development affecting such properties.

Preliminary and final design and construction specifications for joint development ventures, as they affect historic properties described in FHWA's Preliminary Case Report, will be reviewed and approved by the Massachusetts SHPO in consultation with BLC for consistency with the above design guidelines. The MDPW shall ensure, as a condition to disposal of joint development and air rights parcels, compliance with this stipulation prior to and following parcel disposition.

As discussed above, the potential for beneficial or adverse effects on historic properties near the project depends on the preliminary and final design of the project and related joint development. The relevant mitigating measures in the Section 106 Memorandum of Agreement address these effects through review at each phase of design.

Because of the proximity of many historic properties to the construction area, the extent and nature of the construction activity and the fact that so much of the historic area is on land created by the historical process of filling land in and between wharves, construction of the Preferred Alternative could have varying degrees of adverse effect on these properties. These effects may include noise, dust and interference with pedestrian access. Vibration and potential foundation damage due to construction-related lowering of the water table will be avoided through appropriate construction procedures, as described in Section 4.1 DESCRIPTION OF CONSTRUCTION.

Proximity to construction may cause potential structural vibration effects, as described in Section 4.8.2 Vibration Impacts, to the Police Station and Hanover Street Post Off[ice] in the North End District. There w[ill] be potential architectural damage [in] the North End District, Custom Hous[e] District, Faneuil Hall Markets, and the Causeway-North Washington Stree[t] District. There will also be effe[cts] due to noise and dust on these pro[per]ties and the Richardson Block Buil[d]ings, the western portion of the Fulton-Commercial Streets District, and Russia Wharf.

As stated in the Section 10[6] Memorandum of Agreement, FHWA will ensure that potential adverse construction effects on all historic properties described in this secti[on] are minimized or avoided through appropriate preliminary and final design and construction specifications, reviewed and approved by th[e] Massachusetts SHPO in consultation with the MDPW and BLC, and through appointment by the MDPW of a Proje[ct] Conservator whose job description a[nd] qualifications will be reviewed an[d] approved by the Massachusetts SHPO i[n] consultation with the MDPW and BLC. The Project Conservator's responsib[il]ities will include overseeing the development of measures for mitiga[ting] the adverse effects of constructio[n on] standing historic properties. The[se] mitigation measures will be includ[ed] as part of the construction specif[ica]tions.

Effects on Specific Propert[ies]

Where adverse effects will result during redecking of the exi[st]ing Artery with the No-Build Alter[na]tive, that fact is noted below. Otherwise, the No-Build Alternativ[e is] assumed to continue the status quo Numbers refer to Figures 63 and 64

3. Blackstone Block District

Long-Term Effects. This ar[ea] will benefit especially from re-est[ab]lishment of the downtown's visual relationship with the North End, reduced traffic, and potentially improved pedestrian access, which w[ill] be brought about by potential impro[ve]ments such as reconnecting Hanover

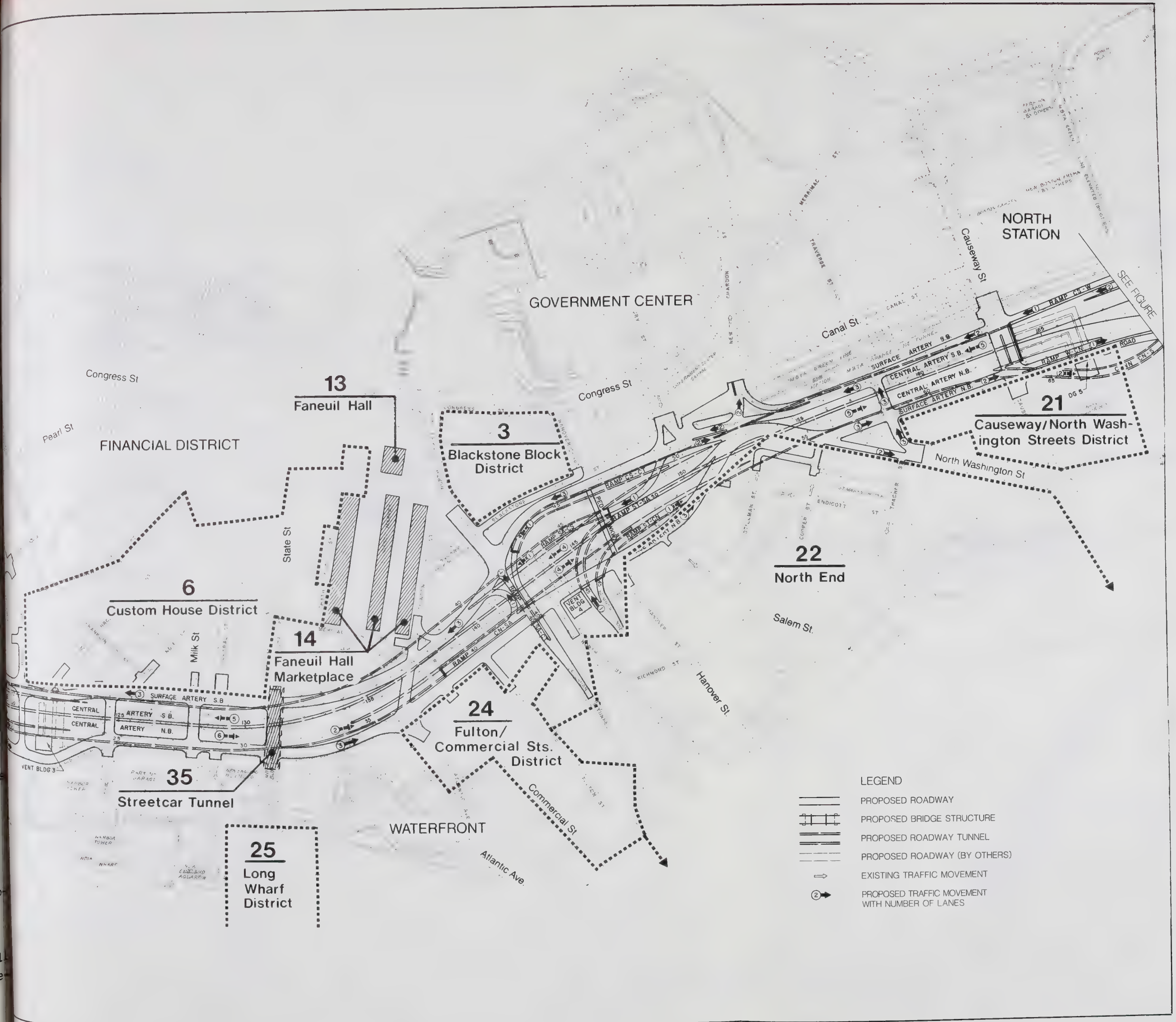


Figure 63

Historic Resources Affected by the Preferred Alternative – 1

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Legend

- Historic Property
- Boundary of Historic District

Numbers correspond to enumeration in text

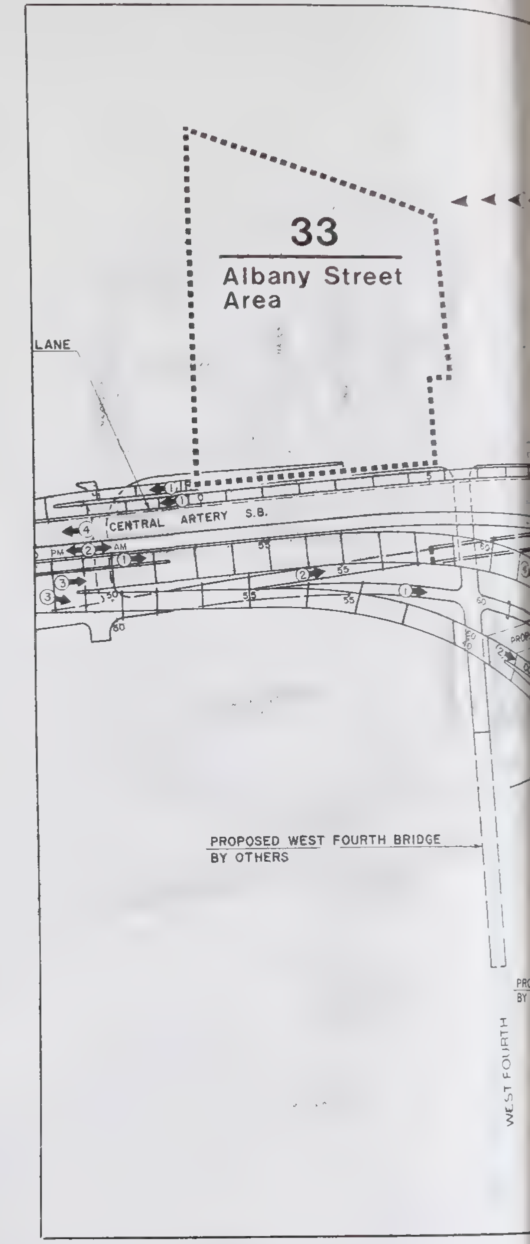


Figure 64
Historic Resources Affected by the Preferred Alternative – 2

0 200 400 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Legend

- Historic Property
- Boundary of Historic District

Numbers correspond to enumeration in text

street and building small-scale structures above the depressed Artery.

Custom House District

Long-Term Effects. Removal of the viaduct will have the beneficial effect of creating an improved visual relationship between this district and the waterfront. It will also allow such important buildings within the District as the Grain Exchange and State Street Block to be viewed from street level without the adverse visual effect of the present viaduct structure. Pedestrian access between this district and its historically connected waterfront will be improved.

13. Faneuil Hall and Faneuil Hall Markets

Long-Term Effects. Removal of the viaduct will have a beneficial effect, improving the visual connection between the Markets and the waterfront (although this connection will be negated in the cases of Quincy Market and South Market, by the construction of Marketplace Center on Parcel D-10). In addition, the character of pedestrian access between the Markets and the Waterfront will be improved.

19. Richardson Block Buildings

Long-Term Effects. Removal of the Central Artery viaduct will have the beneficial effect of opening sight lines and improving pedestrian access around these buildings. The 150-foot opening in the deck over the depressed Artery between Pearl and Oliver Streets to provide ventilation for the Dewey Square Tunnel will have an adverse effect on the context of the buildings, but this effect will be less adverse than that of the existing Central Artery with the No-Build Alternative.

21. Causeway - North Washington Streets District

Long-Term Effects. The alignment of the Preferred Alternative requires the taking of the Charles River Building and the loading dock at the west end of the Stop and Shop Bakery Building for construction of a connecting ramp from the depressed Central Artery northbound to Storrow Drive. Because of its position in relation to the Stop and Shop Bakery Building and the Hoffman Building, and the limited number of buildings in the area, removal of the Charles River Building will further permanently alter the historic fabric and character of this area, which has already been negatively affected by construction of the original elevated Central Artery. Design modification work now underway suggests that a ramp redesign in the area may obviate the need to take the Charles River Building.

The Preferred Alternative will also have the beneficial effect of removing the Central Artery viaduct from the historic Bulfinch Triangle area and partially reuniting the Causeway-North Washington Streets District with the Bulfinch Triangle potentially eligible National Register District to the west.

A ten-story ventilation building measuring approximately 60 feet by 80 feet will likely be built on the former site of the Charles River Building (the vent bulding would be relocated if design modifications eliminated the need to take this building). This new building will not be altogether out of character with the industrial nature of this historic district.

Mitigating Measures. As stated in the Section 106 Memorandum of Agreement, FHWA will ensure that the loading facilities of the Stop and Shop Bakery Building will be modified either to continue present operations or to serve an alternate building use with lesser loading requirements, in order to ensure the continued economic viability of the building. Preliminary and final design and construction specifications for the building modifications will be reviewed and approved by the Massachusetts SHPO in consultation with the BLC.

Design guidelines for the development of the ventilation building will be developed by the MDPW, in consultation with the Massachusetts SHPO and BLC.

FHWA will ensure that prior to alteration or demolition of the Charles River Building and Stop and Shop Bakery Building loading dock, the Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) will be contacted to determine the level of documentation required to provide a permanent record of the properties. All documentation must be accepted by HABS/HAER prior to alteration or demolition of the properties.

22. North End District

Long-Term Effects. The Preferred Alternative will have a beneficial visual effect upon the historic properties of the North End District. It will once again be visually linked with the downtown area, although not in exactly the same manner as it was prior to the construction of the Central Artery. The original Central Artery project removed a series of small irregular streets east of the Blackstone Block District connecting it with the North End. Appropriate guidelines for joint development over the depressed Artery and appropriate final design of surface street connections, in locations shown at the present stage of design, will result in buildings compatible in scale and materials with those in the surrounding districts, which though not recreating the original urban fabric, will approximate it.

A wide area of traffic lanes and open space, or super-block construction, would not be consistent with the historic access to the North End which was through an intricate pattern of narrow streets. The principles discussed in the aesthetic mitigation measures and joint development recommendations (Section 4.4.4) of reinstating a complex pattern of sight lines and appropriately scaled buildings across the depressed Artery will be applied in the development of design guidelines as required in th Section 106 Memorandum of Agreement and will result in an improvement over the present and No-Build situation. Dispersing pedestrian access throug several street connections in this a will likewise reinstate something approximating the historic approach to the North End.

Construction Effects. The North End is particularly sensitive to construction effects since it is a place to live, shop, and visit. For this reason, construction effects will negatively affect historic structures in that economic viability is often a key factor in their preservation and maintenance. Appropriate mitigating measures will minimize these effects.

Mitigating Measures. Appropriate design guidelines regarding height, materials, and massing will be applied to the joint development parcels on the surface right-of-way and design of surface street connections will be reviewed to ensure that adverse effects to the historic context are avoided and minimized, and historic connections between the North End and downtown Boston are partially restored.

24. Fulton-Commercial District

Long-Term Effects. Removal of the Artery viaduct will potentially improve the visual relationship between this district and the Faneuil Hall Markets-Blackstone Block area, with which it was historically closely connected. The Preferred Alternative allows potential improvements such as those aesthetic mitigation measures and joint development recommendations for building over the depressed Artery and reconnecting streets which are discussed in Section 4.4.4 Joint Development; these measures will be applied to the development of design guidelines for joint development and design review of surface improvements to reestablish a continuity in urban fabric which will improve the character of the pedestrian access between these two historically important areas

5. Long Wharf

Long-Term Effects. Removal of ne Central Artery viaduct will have a ositive effect on restoration of the istoric relationship between Long harf and State Street, with the Old tate House at its head, one of the ost important historic sightlines in oston. This visual relationship will e stronger, and pedestrian access ill be improved.

7. Russia Wharf

Long-Term Effects. There will e no long-term effects on Russia Wharf.

29. Fort Point Channel District

Long-Term Effects. Changes to the physical configuration of the Channel as a result of the Preferred Alternative will include introduction of a partially visible tunnel box, removal of part of the historic bulkhead, removal of the Old Colony Railroad Bridge and the temporary alteration of one span of the Summer Street Bridge, and visual effects to the historic character of the district due to the introduction of a surface roadway and ventilation building (see Figure 82 in Section 5.2.3 Fort Point Channel District of the Section 4(f) Evaluation).

The southern end of the Channel will be filled to a new bulkhead line located to the east of the existing Dorchester Avenue Bridge (near the Gillette property in South Boston). The historic bulkhead line on the Boston side of the Fort Point Channel will be altered by construction of a two-lane, northbound new Dorchester Avenue which will extend approximately 30 feet inside the Channel, from the Dorchester Avenue Bridge to a point approximately 400 feet south of the Summer Street Bridge. The road will be built on slurry walls with four-foot square knock-out panels to allow water to pass through, with a false bulkhead of granite and a 10-foot adjacent pedestrian walk. In the 400 feet south of Summer Street, a deck, slightly lower than new Dorchester Avenue, will be constructed on top of the tunnel box. The deck plus Dorchester Avenue will project 80 feet into the Channel from the existing bulkhead line, then taper toward the existing bulkhead. The existing channel is approximately 500 feet wide in this area. At Summer Street, the new deck will project 40 feet from the existing bulkhead line; at Congress Street it will project 15 feet into the Channel; at a point 100 feet north of Congress Street the new bulkhead will meet the existing bulkhead line. A total of 88,500 square feet, or 9.5 percent of the Channel will be occupied by the Preferred Alternative.

Only the Old Colony Railroad Bridge will be removed by the Preferred Alternative. On the Boston side of the Channel, the Summer Street Bridge will have one span dismantled and reconstructed; its profile and symmetry will not be altered. Congress Street Bridge will not be affected.

The construction of a Seaport Access Tunnel through South Boston will displace two buildings (40 Wormwood Street and 293 A Street) in the Boston Wharf Company section of the Fort Point Channel District. These buildings do not contribute to the significance of the district, nor does the architectural character qualify the buildings for eligibility for the National Register. Removal of these buildings will not affect the integrity of the District.

A 10-story ventilation building measuring approximately 80 feet by 90 feet is proposed on the filled portion of the Channel south of Dorchester Avenue.

Construction Effects. During construction, vehicular and water access to the Fort Point Channel area will be disrupted as a result of successive closing or reduction in width of the bridges, the placement of steel sheet piling in the Channel, and the presence of barges and construction equipment. The construction

activities themselves may also affect the area and its use as a result of construction-related noise, dust, and vibration.

There will also be adverse effects due to construction in the Boston Wharf Company section of the Fort Point Channel District. The Preferred Alternative will create short-term noise, dust, and vibration affecting this area's industrial and commercial buildings, a number of which have been recently rehabilitated.

Mitigating Measures. As stated in the Section 106 Memorandum of Agreement, FHWA will ensure that design development in this area will include the following:

o Design and location of the ventilation building in a manner that is sympathetic to, and respectful of, the characteristics of surrounding historic properties with regard to massing, color, building material, detail, and scale.

o Granite facing will be used in the new section of the Fort Point Channel bulkhead to make it visually consistent with the existing bulkhead in color, texture, configuration, and design.

o Reconstruction of the one span of the Summer Street Bridge removed during project construction will be in a manner that reuses as much original fabric as possible and results in the same configuration as the original.

o Landscaping improvements along the Boston side of the Channel will be designed to enhance those characteristics of the historic district that make it eligible for listing in the National Register of Historic Places.

o During preliminary project design, there will be continuing study and negotiation with the U.S. Postal Service concerning the use of land between the existing Dorchester Avenue and the Channel bulkhead for project right-of-way. The final design of the New Dorchester Avenue will be such as to minimize effects to the historic characteristics of Fort Point Channel and adjacent historic properties, including effects to pedestrian and vehicular traffic flow.

o Preliminary and final design and construction specifications, will be submitted to the Massachusetts prior to start of construction for review and approval in consultation with the BLC regarding consistency with the design development guidel outlined above.

33. Albany Street Area

Long-Term Effects. There w be no significant effect on this historic area.

35. Streetcar Tunnel

Long-Term Effects. There w be no significant effect on this historic structure.

Construction Effects. Vibra tion could cause potential structural damage.

Mitigating Measures. Constr tion period mitigating measures include tunnel reinforcement, plac ment of piles on either side of th tunnel, and spanning over the tunn with the Central Artery structures granular cushion material will be placed between the Blue Line and Central Artery tunnels. (See the Supportive Engineering Report for more detailed discussion of these techniques.)

4.14.3 Archaeological Effects

A Phase I, Step 1 archaeolo cal survey was performed during th preparation of the SDEIS/SDEIR for Preferred Alternative. The Phase survey results indicate a high prob bility of locating archaeological properties in the following areas: South Bay/South Cove (prehistoric historic), Fort Point Channel (his toric), Fort Hill (historic), Cent Artery corridor from Dewey Square Causeway Street (prehistoric and

istoric), Logan Airport (historic), nd South Boston corridor (prehistoric nd historic).

As stated in the Section 106 emorandum of Agreement, FHWA will nsure that a Phase I, Step 2/Phase II nvestigation is initiated 90 days ollowing ratification of the Section 06 Memorandum of Agreement and elease of funds for additional lanning and design studies. This nvestigation will include, at a inimum, the following elements:

Preparation of an appropriate esearch design, outlining and justi-ying important research problems that ay be addressed by investigation of rchaeological properties in the roject area, and a proposed scope of ork and work plan for field investi-gation integrating the results of the ollowing work:

- acquisition of additional historical documentary information on past disturbances that may preclude areas from field testing and

- acquisition of additional historical documentary information concerning potential significance of historic and prehistoric archaeological remains.

This program for investigation, including the research design, scope of work and work plan, will be reviewed by MDPW and the SHPO prior to implementation.

Field testing and evaluation will be implemented based on the scope of work and work plan and in the context of the research design.

A written report describing the results of the documentary research, field testing and applied National Register criteria and containing recommendations on the significance of identified resources will be provided to MDPW, the Massachusetts SHPO, and BLC. These recommendations will be subject to review by MDPW and the Massachusetts SHPO in consultation with BLC.

Based on the results of the documentary research and field testing work, a plan will be developed in consultation with the SHPO and BLC that includes provisions for avoidance or preservation in place of significant archaeological remains, where feasible and practical, through design and engineering development or construction specifications as set forth above. If avoidance or preservation in place is not feasible and practical, and the SHPO concurs in this determination, the plan will include provisions for Phase III data recovery or other appropriate treatment. The plan will be submitted to the Massachusetts SHPO and the Advisory Council for review and approval in consultation with BLC prior to implementation.

At such time as the nature, extent, and locations of necessary utility line relocations are known, identification, evaluation, and treatment plan preparation and implementation will be done in the same manner as set forth above for any significant archaeological properties which may be affected by these activities.

All historic and archaeological investigations called for under these stipulations will be conducted by individuals who meet, and in a manner consistent with, the Advisory Council's standards and guidelines.

4.15 UTILITIES

4.15.1 Comparison of Alternatives

All build alternatives would have significant impacts on the existing utilities in the project area. However, no long-term service disruptions would occur with any of the alternatives. The Preferred Alternative affects more major utilities than any of the other alternatives.

Utility impacts of Alternative 5A would be similar to the Preferred Alternative. Alternatives 3A and 6

have major utility impacts in the Central Artery corridor, including South Bay, while Alternative 3A would also affect utilities in East Boston.

The Tunnel-Only alternatives (Alternatives 2, 3, 4 and 5) would not affect utilities in the Central Artery corridor. Utilities in the South Bay and Fort Point Channel parts of Boston, and in East Boston, would be affected by these alternatives.

The No-Build Alternative would have no effect on existing or future utilities.

4.15.2 Preferred Alternative

Section 3.12 identified the extensive system of public and private utilities within the project area which will be affected by the Third Harbor Tunnel/Central Artery project. These utilities, which include water, storm drains, sanitary sewers, combined sewers, gas, electric lines, communications, etc., will be either temporarily supported or permanently relocated as part of this project. The proposed highway construction will have a major impact on utilities as a result of the relocations necessary. The impact will not be from service disruptions, but from the traffic congestion and disruption caused by their relocation. No long-term service disruptions will occur, although slight service disruptions may occur when the crossover from the old to the new utility occurs. Extensive coordination with utility owners will be required during the design and construction phases of the project to minimize any inconveniences caused by the construction. More detailed descriptions of these utility relocations are contained in the Supportive Engineering Report.

The following is a brief description of the major utilities requiring relocations by geographic area:

Boston - South Bay

- 36-inch x 36-inch combined sewer outfall at Congress Street a[nd] Dorchester Avenue.
- 60-inch combined sewer outf[all] at Summer Street and Dorchester Av[enue].
- 60-inch combined sewer outf[all] at the Dorchester Avenue Bridge.
- Force mains of 36-inch and 8-inch diameters from Massachusett[s] Turnpike Authority Pump House No. [...]
- Twin chamber (20-foot x 15.5-foot each) Roxbury Canal Cond[uit] outfall into the Fort Point Channe[l].
- Existing utilities within t[he] Boston Edison utility tunnel, cros[sing] the Fort Point Channel between Congress Street and Summer Street.
- Telephone ducts within a te[le]phone submarine cable between Cong[ress] Street and Summer Street under the Fort Point Channel from Dorchester Avenue to Sleeper Street in South Boston.
- 16-inch and 24-inch water m[ai]n crossing Fort Point Channel, from Dorchester Avenue at Congress Stre[et] to Northern Avenue in South Boston
- 115,000 volt electric lines from Harrison Avenue, suspended on Broadway Bridge, crossing to South Boston at Dorchester Avenue.
- 115,000 volt electric lines from Boston Edison sub-station, crossing Fort Point Channel to Sou[th] Boston near Northern Avenue.
- Possible reconfiguration of this substation.
- 120-inch x 36-inch combined sewer outfall proposed by others a[t] Albany Street near Traveler Street
- 30-inch intermediate pressu[re] gas pipe crossing in the area of t[he] Turnpike ramps and the railroad ya[rd], from Kneeland Street to Albany Str[eet].
- 32-inch x 54-inch East Side Interceptor combined sewer located [...]

ie vicinity of the railroad yards and :ossing under the Turnpike ramps.

The Gillette Company discharge ipes in South Boston at the southern id of the Fort Point Channel.

Telephone ducts in South Bay.

20-inch force main proposed by thers, crossing Albany Street at roadway and running parallel to the orth side of the Broadway Bridge to n outfall in South Bay.

Massachusetts Turnpike Authority Pump House No. 7.

Amtrak railroad signal and communications cable on facilities crossing the Fort Point Channel will also have to be relocated during construction.

Boston - Central Area

o 115,000 volt electric lines at Purchase Street, from Oliver Street to Atlantic Avenue.

o East Side Interceptor at Atlantic Avenue and Northern Avenue.

o 84-inch storm drain at Milk Street from the Surface Artery southbound to Atlantic Avenue.

o 66-inch sewer at Milk Street, from the Surface Artery southbound to Atlantic Avenue.

o 30-inch x 36-inch sewer at Hanover Street, from Blackstone Street to Cross Street.

o 30-inch x 36-inch sewer at Sudbury Street from Blackstone Street to Cross Street.

o East Side Interceptor at Atlantic Avenue and India Street.

o 60-inch storm drain at Commercial Street from Clinton Street to Atlantic Avenue.

o 30-inch x 36-inch sewer at Traverse Street and North Washington Street.

o 115,000 volt electric lines at Causeway Street, from Haverhill Street to Medford Street.

o Telephone cables at State Street, from the Surface Artery southbound to Atlantic Avenue.

o 30-inch gas main at Purchase Street, from India Street to High Street.

o 30-inch gas main at Cross Street and Commercial Street.

o Two 60-inch pipes (inverted sewer siphon) at Traverse Street under the MBTA Orange Line.

o 102-inch sewer, from the siphon at Traverse Street to North Washington Street.

o 57-inch x 60-inch sewer, from North Washington Street and New Chardon Street to Cross Street.

o MDPW Pump House No. 1 and electrical substation at Traverse Street near Haverhill Street.

o MDPW Pump House No. 2 at Haymarket Square near Cross Street and Blackstone Street.

o MDPW Pump House No. 4 at Clinton Street and Commercial Street.

o MDPW electrical substation at Atlantic Avenue near High Street.

o MDPW Pump House No. 5 at High Street near Purchase Street.

o 66-inch sewer at Cross Street, from new Chardon Street to Commercial Street.

o 42-inch sewer at Commercial Street, from Cross Street to Clinton Street.

o 66-inch drain at Commercial Street, from Clinton Street to Cross Street.

o 72-inch sewer at Oliver Street from Purchase Street to Fort Point Channel outfall.

o 16-inch LS and 16-inch HS water mains, a 12-inch gas main, six 5-inch electric (MBTA AC), sixteen 5-inch electric (Boston Edison), and twelve 4-inch telephone from Haverhill Street to Canal Street.

o The Boston Edison substation located on Atlantic Avenue may require reconfiguration due to the proximity of the Central Artery northbound tunnel.

Boston - North of Causeway Street Area

o Twin 48-inch Combined Sewer (CS) siphon exiting into 39-inch x 39-inch CS at Leverett Circle.

o Lowell Street weir structure with 48-inch and 54-inch CS exiting pipes; Charles River CS river crossing structure and 84-inch inlet and outlet pipe.

o Two major telephone services (Boston-Cambridge A Cable); one with 12, 3.5-inch conduits and one with 12, 3-inch conduits.

o 36-inch water main parallel to Interstate Route 93 on the easterly side.

o Thirty-six 4-inch telephone ducts and a 36-inch water main in the vicinity of Beverly Street, north of Causeway Street.

o The West Side Interceptor at Causeway Street from Haverhill Street to Martha Way.

o Two 115KV pipe-type electric cables in Causeway Street from Haverhill Street to Canal Street.

o Design modifications to eliminate impacts to the Charles River's edge may require the taking of the Boston Edison power plant located on Nashua Street.

South Boston

o 72-inch storm drain along Mt. Washington Avenue to Fort Point Channel.

o In A Street: 54-inch storm drain; 24-inch sanitary sewer; 16, 4-inch New England Telephone Co. ducts; and a 16-inch water main.

o 115,000 volt electric lines Summer Street and Congress Street.

o 115,000 volt electric lines 16-inch gas main, 2-16 inch water lines and an 18-inch sewer in North Avenue near 8th Street.

o General Ship Power Plant near Drydock No. 4 at C Street and 7th Street.

o Telephone/Electric duct banks servicing local area.

o 24-inch sanitary sewer from Northern Avenue and Trilling Way t Summer Street pump station.

o 115,000 volt electric lines i Massport haul road from Northern Avenue to Summer Street.

East Boston - Airport Property

o 60-inch storm drain located i the vicinity of the General Aviation Building.

o 8-inch sanitary force main located along the easterly side of t General Aviation Building.

o 10-inch fuel line in the vicinity of the Porter Street outfl

o 10-foot x 12-foot Porter Stre combined sewer outfall.

o 12-inch water main near the southerly end of the Eastern Air Freight Building.

o 18-inch sanitary sewer in the vicinity of the Hilton Hotel.

o Major telephone line and 20-inch water main to the west of the Hertz Check-In Center; a 60-inch drain, and telephone and electric ducts to the east of the Hertz Cente

o In the vicinity of the Exxo

on: major telephone lines and a
ch water main.

At Bird Island Flats, one 10x10
drain and twin 12x10 foot con-
culverts.

12-inch gas line and a 20-inch
line in the vicinity of the MBTA
tation.

12-inch gas line located behind
ilton Hotel.

AESTHETIC IMPACTS

1 Comparison of Alternatives

The Preferred Alternative will
e the elevated Central Artery
downtown Boston and significantly
ove the environment visually and
stically. Alternatives 3A, 5A and
ve similar aesthetic impacts in
area. The No-Build Alternative
Alternatives 2, 3, 4 and 5 will
change the appearance or aesthetic
acter of downtown Boston.

The Preferred Alternative will
r the appearance of Fort Point
nel and will increase pedestrian
ssibility to the Channel. The
uild Alternative has no impacts on
Point Channel; Alternative 5A has
lar, but lesser (due to the lack
new Dorchester Avenue) impacts on
Point Channel than the Preferred
rnative; Alternatives 2, 3, 3A, 4,
nd 6 have negative aesthetic
cts on Fort Point Channel.
res 65 - 70 present existing views
he Fort Point Channel from the
er Street and Congress Street
dges, and the future views with the
erred Alternative and with Alter-
ives 2, 3, 4, and 5 for comparison
oses.

The Preferred Alternative will
e negative aesthetic impacts on the
er Charles River Basin in the North
tion area. Similar impacts would
ur with Alternatives 3A, 5A and 6.
No-Build Alternative and Alterna-
es 2, 3, 4 and 5 would not have
thetic impacts in this area.

o The Preferred Alternative will not have aesthetic impacts on the residential community of East Boston because the project roadways occur well within the limits of Logan Airport. Alternatives 3, 3A, 5 and 5A would place a ventilation building, toll plaza and associated support facilities on Logan Airport property, closer to the East Boston community where they would be visible to some residents of Jeffries Point. Alternatives 2 and 4 would have significant adverse aesthetic impacts on the East Boston community, as their alignments pass through the center of the residential area along the Conrail right-of-way. The No-Build Alternative and Alternative 6 would have no aesthetic impacts on East Boston.

o The Preferred Alternative will have significant adverse visual impacts on the South Bay area. The area will change from railyards, primarily below the elevation of surrounding areas, to one with major highway ramps that are much taller than surrounding structures. Alternatives 2, 3, 3A, 4, 5, 5A and 6 would also change the appearance of this area, although less radically. The No-Build Alternative would not affect the South Bay area.

4.16.2 Aesthetic Impacts

The aesthetic impacts of the Preferred Alternative are compared to the No-Build Alternative in eleven geographic sub-areas (see Figure 71). The sub-areas reflect the patterns of land use and development activity that exist, or would be established, when the land within the Central Artery corridor becomes available for re-use. The categories for analysis are:

1) the view from the road;
2) the view of the road; and,
3) the pedestrian environment.

The majority of motorists using the new transportation facilities included in the Preferred Alternative will be driving inside a tunnel. For these people the view from the road

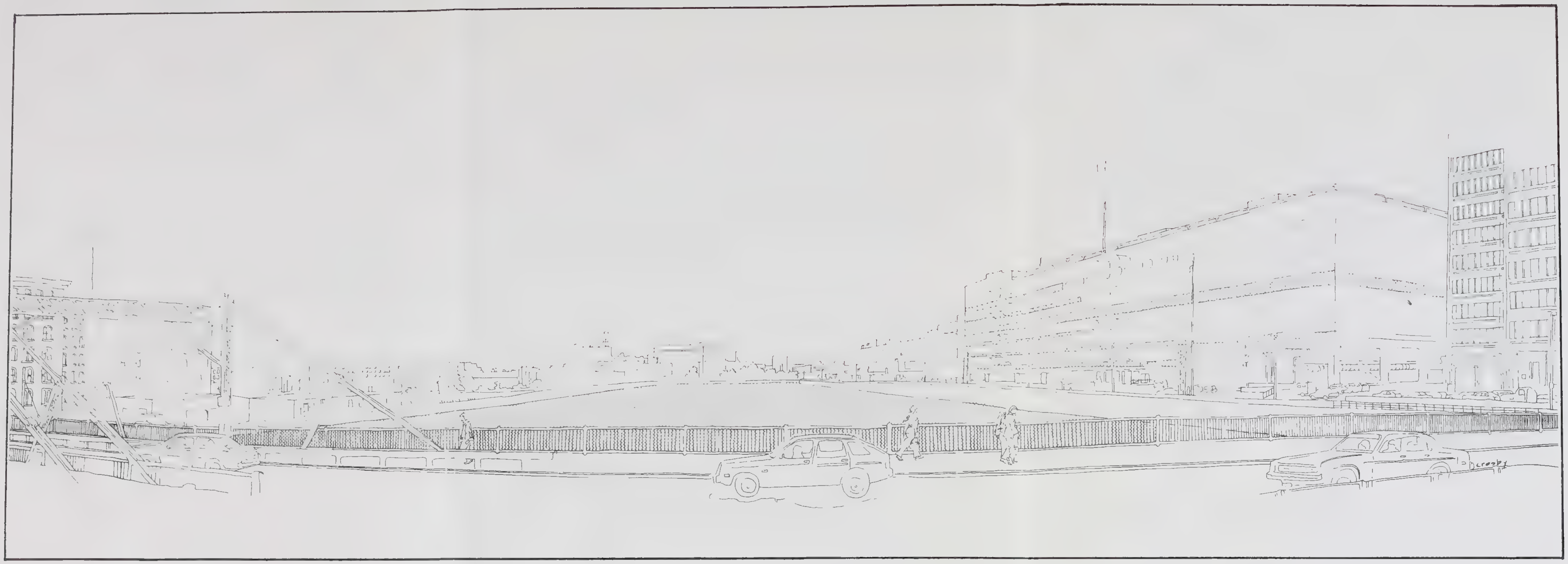


Figure 65
Existing: View looking south from th
Summer Street Bridge.
EIS/EIR for I-90 – Third Harbor Tunnel: I-93 – Centra

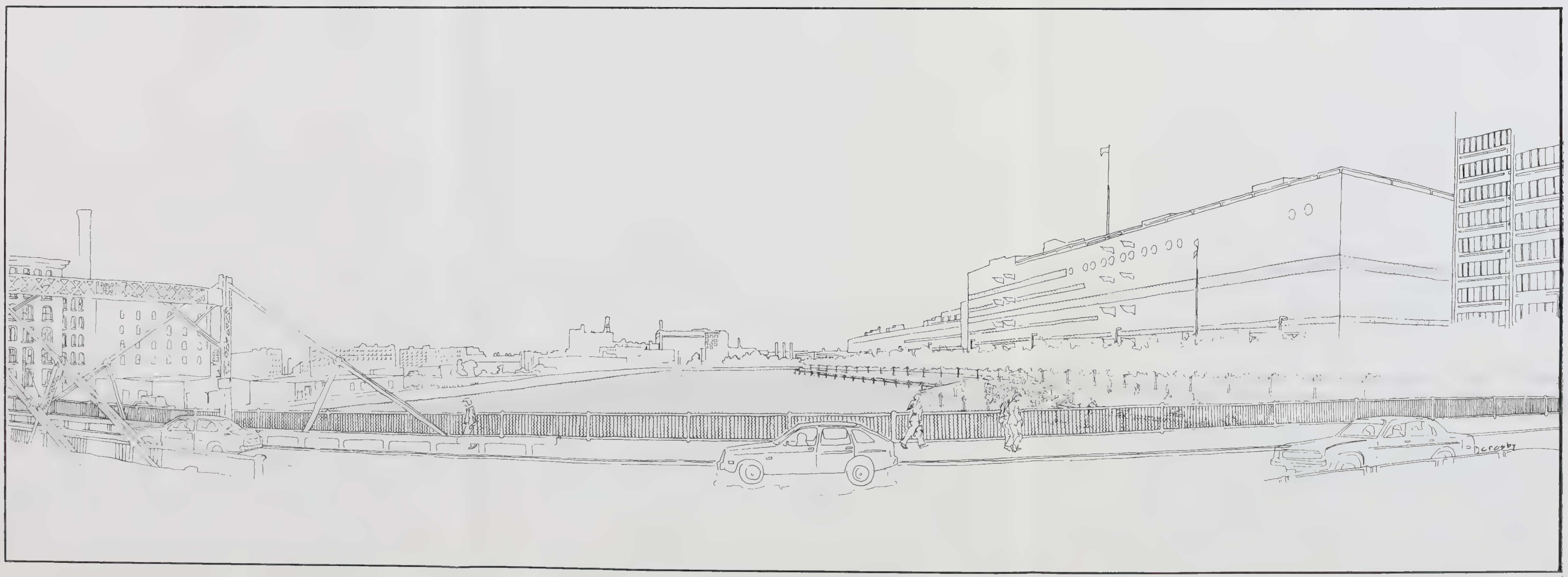


Figure 66
After Construction (Preferred Altern
View looking south from the Summe
Street Bridge.
EIS/EIR for I-90 – Third Harbor Tunnel: I-93 – Centra

Note: The Drawings on this page depict previously rejected Alternatives. They are included for comparison with the Preferred Alternative.

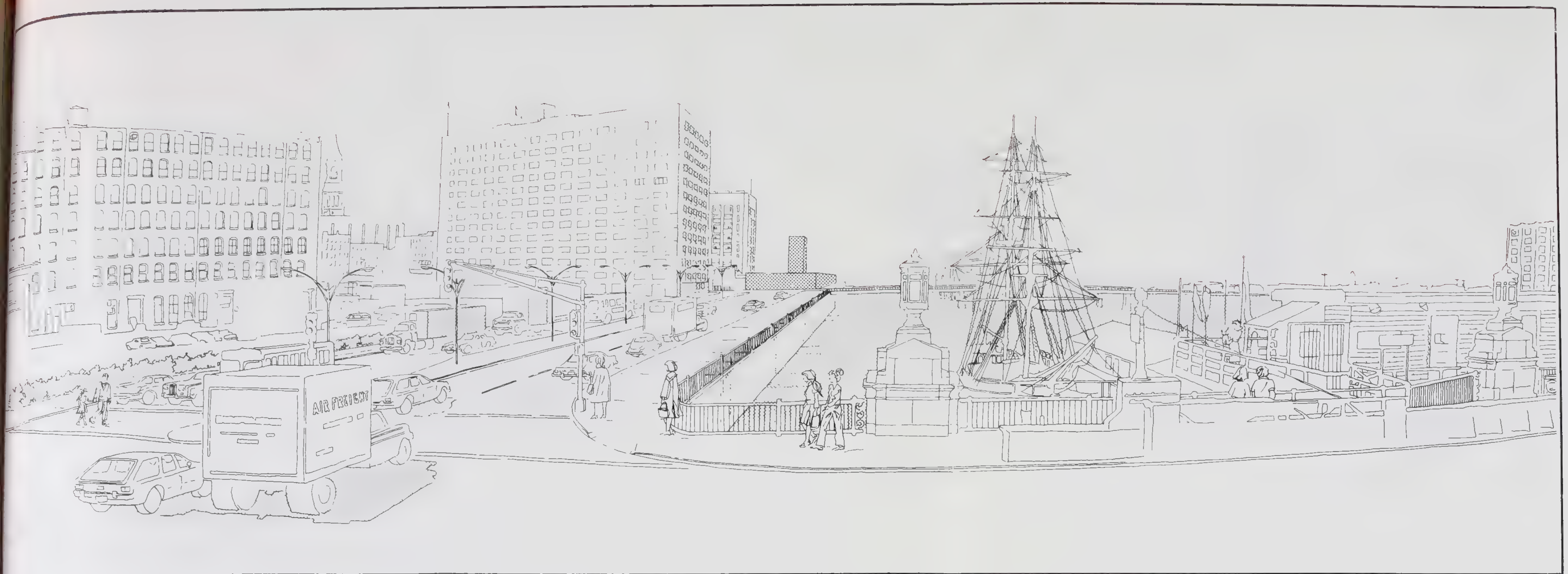


Figure 67
After Construction (Alternatives 2 and 3):
View looking north from the Congress Street Bridge.

Figure 68
After Construction (Alternatives 4 and 5):
View looking south from the Summer Street Bridge.

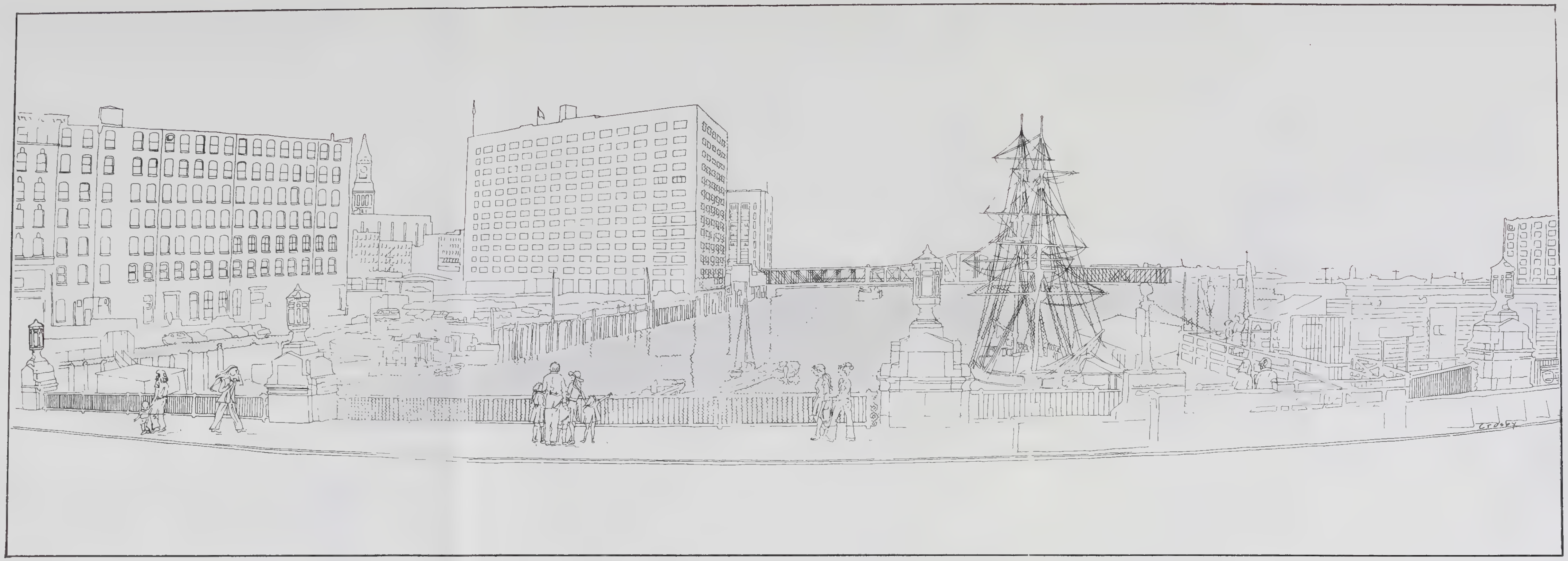


Figure 69

Existing: View looking north from the Congress Street Bridge.

EIS/EIR for I-90 – Third Harbor Tunnel: I-93 – Central Artery

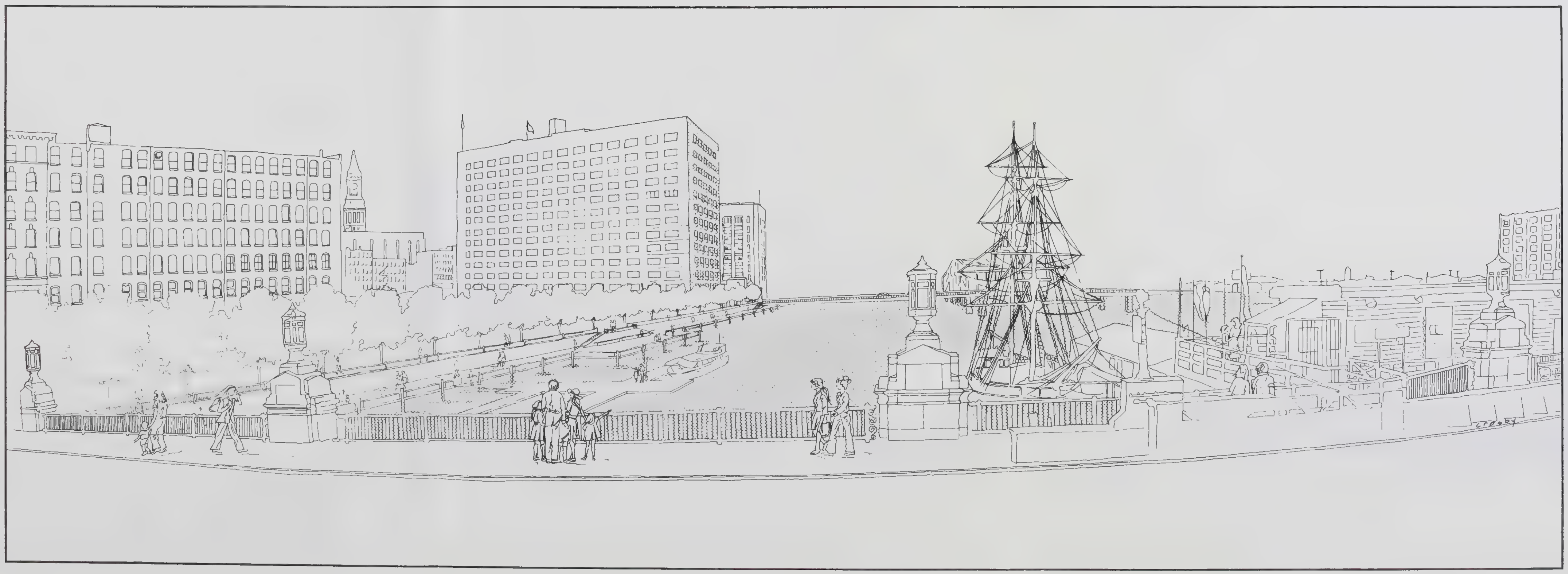


Figure 70

After Construction (Preferred Alternative) View looking north from the Congress Street Bridge.

EIS/EIR for I-90 – Third Harbor Tunnel: I-93 – Central Artery

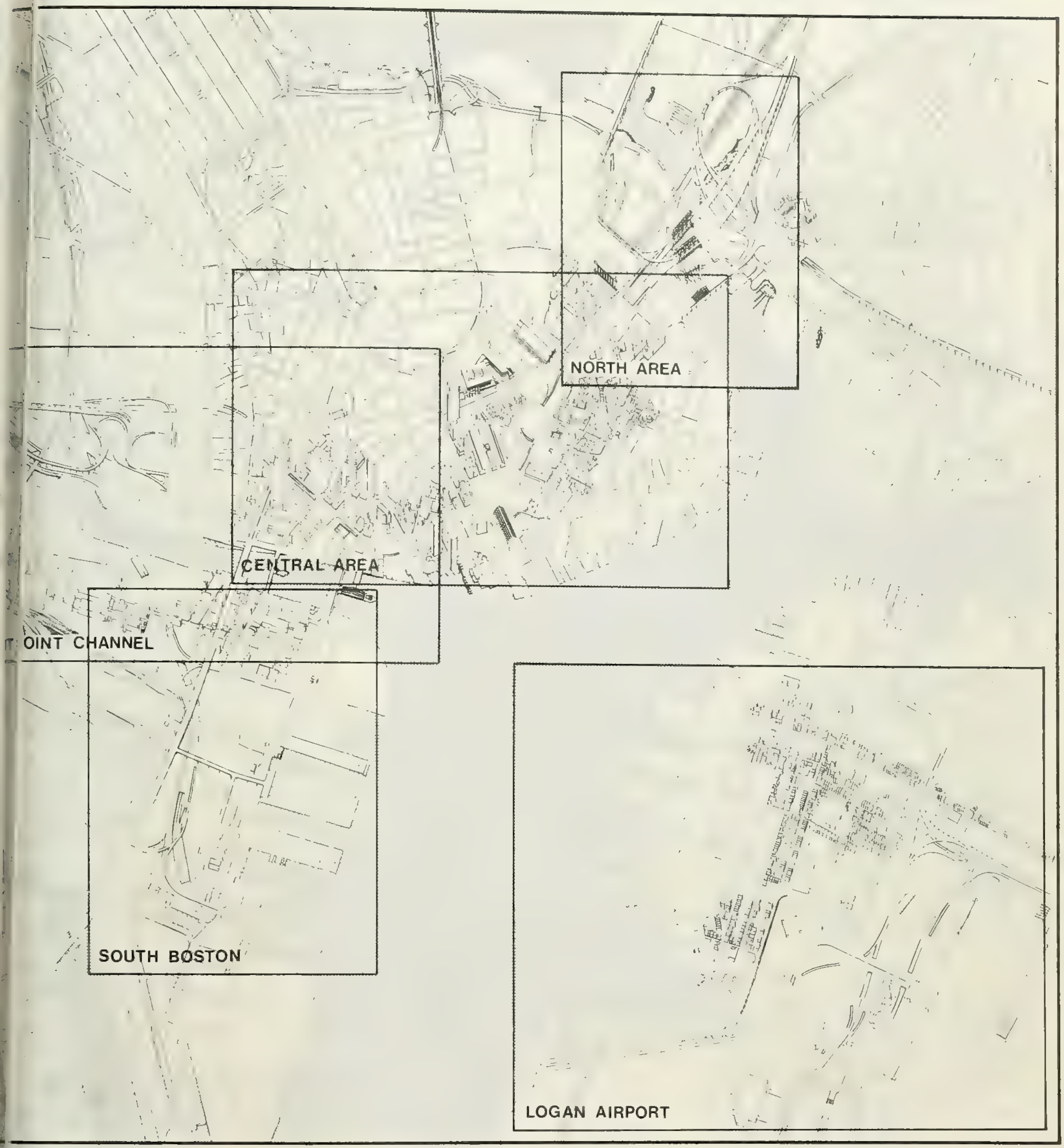


Figure 71
Key Plan Preferred Alternative
Boston

will be of tiled tunnel walls and of other vehicles. Since this experience will be similar throughout the project area it is only described in some detail once in Section 4.16.2.

Aesthetic impacts are compared to the No-Build Alternative; the aesthetic environment without the project is described in Section 3.13 Visual Characteristics.

Mitigating measures for aesthetic impacts are described briefly for each geographic sub-area. Additional information about various enhancement measures such as landscaping, joint development, engineering design modifications, and urban design improvements are discussed in greater detail in Section 4.4.4 Joint Development.

South Bay Area

View from the Road

The experience of entering Boston from the south will be significantly altered. Those motorists exiting from the Southeast Expressway to Kneeland Street or the westbound Massachusetts Turnpike will be afforded dramatic views of Fort Point Channel, downtown Boston and Boston Harbor. The ramp which provides these connections will rise to almost 60 feet above grade and curve across the South Bay area (see Figure 72).

Motorists going from the Southeast Expressway to new Dorchester Avenue will be afforded similar views, from the connecting ramp which rises to 40 feet above grade.

View of the Road

The South Bay area will be completely altered in appearance by the project. What is now water and railyards will become a network of ramps which are larger in scale than the existing railroad bridges, signal towers and other structures in the immediate area.

A large number of ramps and realigned city streets will be at or above ground level and will be visib[le] from other roadways and from the windows of structures in the area. The geometry of the roadways will reduce the amount of visible ground area. Shadows cast by elevated ramps will limit the landscaping which can be planted. The scale of the highway elements, and their height (up to 60 feet above grade), will form a visual wall between South Boston and the South End.

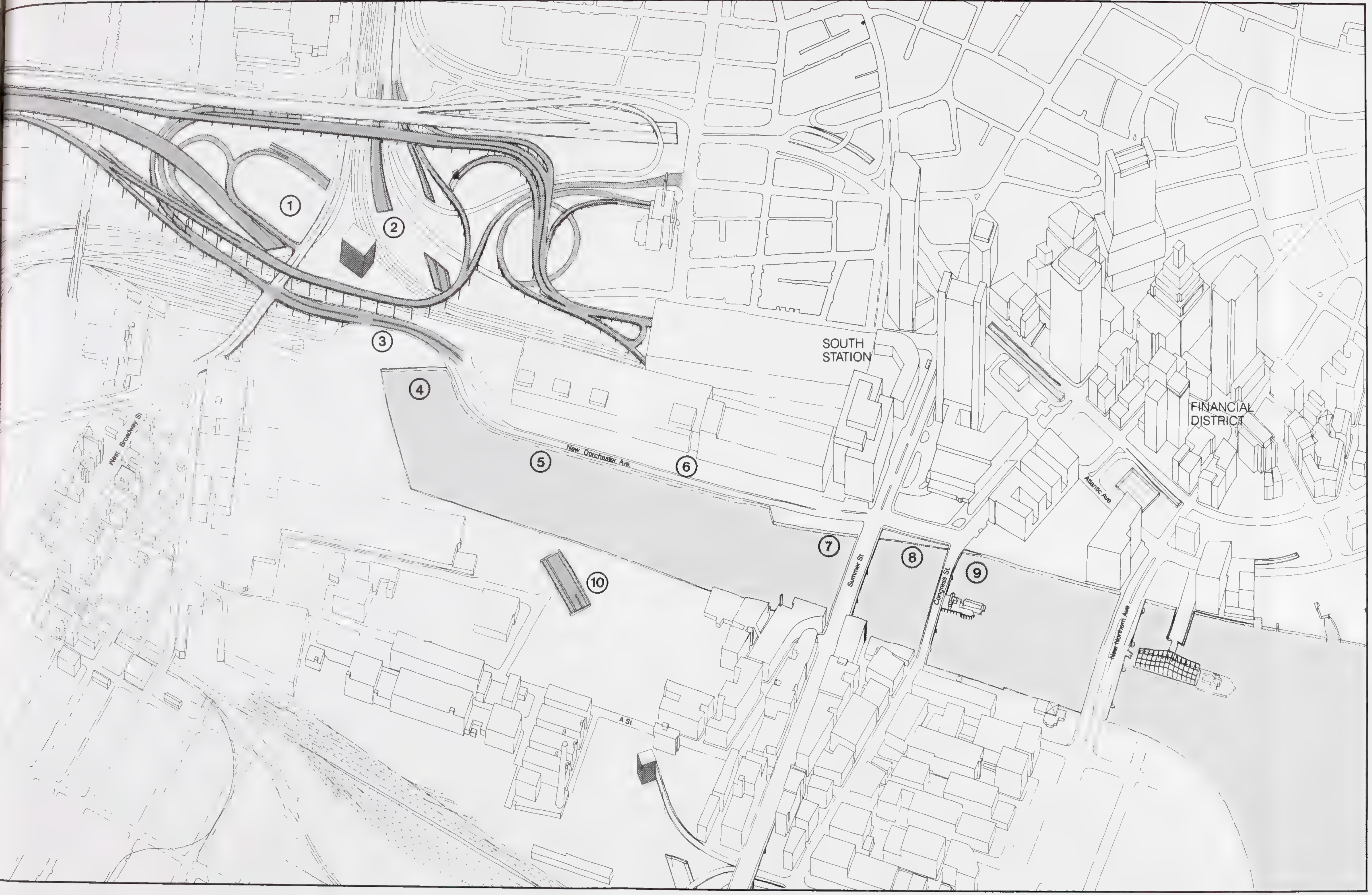
Pedestrian Environment

The majority of pedestrians wh[o] will see this area will be people walking between South Boston and downtown via Dorchester Avenue. The Herald Street extension and new Dorchester Avenue will be designed to accommodate pedestrian traffic. This will enhance pedestrian access. A pedestrian easement may be required across the parcel which is created between existing Dorchester Avenue an[d] new Dorchester Avenue.

The scale of the new highway ramps will be significantly larger than the existing elements in the landscape. The Broadway Bridge is currently the highest roadway in the South Bay area. The new connecting ramp between the northbound Artery an[d] the Massachusetts Turnpike will be 3[5] feet higher than the existing Broadwa[y] Bridge. Herald Street Extension will replace the existing Broadway Bridge. This ramp will be designed so as not to visually overwhelm pedestrians using the Herald Street Extension.

Mitigating Measures

The highway elements to be located in the South Bay area can be visually interesting, and can create dramatic landscape with their grade changes and curving alignments. Well designed roadways can be a form of urban sculpture if they are designed with that as a goal. For motorists approaching Boston from the south or west, this area will provide the firs[t] image of downtown Boston; it is important that it be handsomely



Aesthetic Impacts – South Bay/Fort Point Channel and mitigating measures

1. Existing South Bay area is characterized by industrial architecture, bridges, and open water. The scale and height of the many new bridge and ramp structures will create a physical and visual barrier between South Boston and the South End. Views of the Financial District from the new Kneeland Street off-ramp will create a dramatic entry to the city.
2. Ventilation building will be a prominent visual landmark from relocated Dorchester Avenue, the new Herald Street Extension bridge, and new connecting ramps. Mitigating Measures: reduce height of structure and use special architectural treatment. Vent stack height may be altered based on additional air quality analysis.
3. Relocation of Dorchester Avenue to the west creates less direct pedestrian access from South Boston to the Fort Point Channel walkway. Mitigating Measure: Provide pedestrian easement from Fort Point Channel to Foundry Street.
4. Bulkhead at location of former Dorchester Avenue bridge creates a new terminus to Fort Point Channel lessening the visible water area.
5. New bulkhead line projects 36′ into the Channel from the existing bulkhead. Mitigating Measure: Replace granite face on new bulkhead.
6. New Dorchester Avenue provides new pedestrian walkway connecting South Boston with downtown and offers views of the Channel.
7. Top of tunnel box is visible above the water line with the new bulkhead line projecting 60′ to 80′ from existing bulkhead. Mitigating Measure: Provide public open space on deck over the tunnel.
8. New bulkhead line projects 15′ to 40′ into the Channel from existing bulkhead. Mitigating Measure: Provide public open space on deck over the tunnel
9. New bulkhead projects 10′ into Channel at Congress Street bridge and curves back into existing bulkhead 100′ to the north. Mitigating Measure: Integrate deck over tunnel into pedestrian walkway
10. Open section of tunnel is visible from adjacent areas Mitigating Measures. Placement of louvers to visually screen roadway opening.

Ramps and Open Sections

Ventilation Buildings,

Figure 72
Summary of Aesthetic Impacts and Measures to Minimize Harm
Preferred Alternative
South Bay/Fort Point Channel

0 200 400 Feet

designed.

South Boston

View from the Road

The experience of motorists driving on the roadway will alternate between enclosed tunnel sections and open depressed roadway sections (see Figure 73). The motorist exiting or entering the tunnel at the Congress Street exit will see the Fort Point Channel 19th century warehouse district (Boston Wharf Company) on the west, as well as new development to the north and east.

View of the Road

From Commonwealth Flats, the project's toll plaza, ramps and ventilation buildings will be visible in open cut from Summer Street to the eastern edge of Commonwealth Flats. Since this property is not yet fully developed, it is difficult to predict what the visual impact will be in the future. However, it is clear that the highway facilities and ventilation structure will be visually significant.

If current Massport plans for parking and fish distribution are put into effect, the impact is not expected to be significant because these uses are not particularly visually sensitive.

The road will be most visible from Viaduct Street; the view from this point will include the toll plaza, Northern Avenue ramps, and ventilation buildings. The ventilation buildings located east of Viaduct Street will be placed within an industrial landscape, within which they will be the tallest elements. The ventilation building located north of Northern Avenue will be visible from the harbor and possibly from across the harbor.

The ventilation building near A Street will be a noticeable element in this area of 19th century industrial buildings.

The access road connecting the tunnel to Northern Avenue requires a right-of-way wider than the streets it parallels. The visual separation which it creates between the existing structures on Stillings Street and the parcel to the east of the access road will not allow the continuation of the area's existing street and building pattern.

Pedestrian Environment

The area in which the Preferred Alternative is located does not presently attract a great number of pedestrians. Future plans for the area concentrate pedestrian use along the waterfront side of Northern Avenue, and are not affected by the project. The depressed highway will not be visible from Northern Avenue. Ventilation buildings and ramps will be visible, but not significant to the overall appearance of the area.

In the Congress Street area, tunnel-related signing and lighting will be noticeable elements in the pedestrian environment.

Mitigating Measures

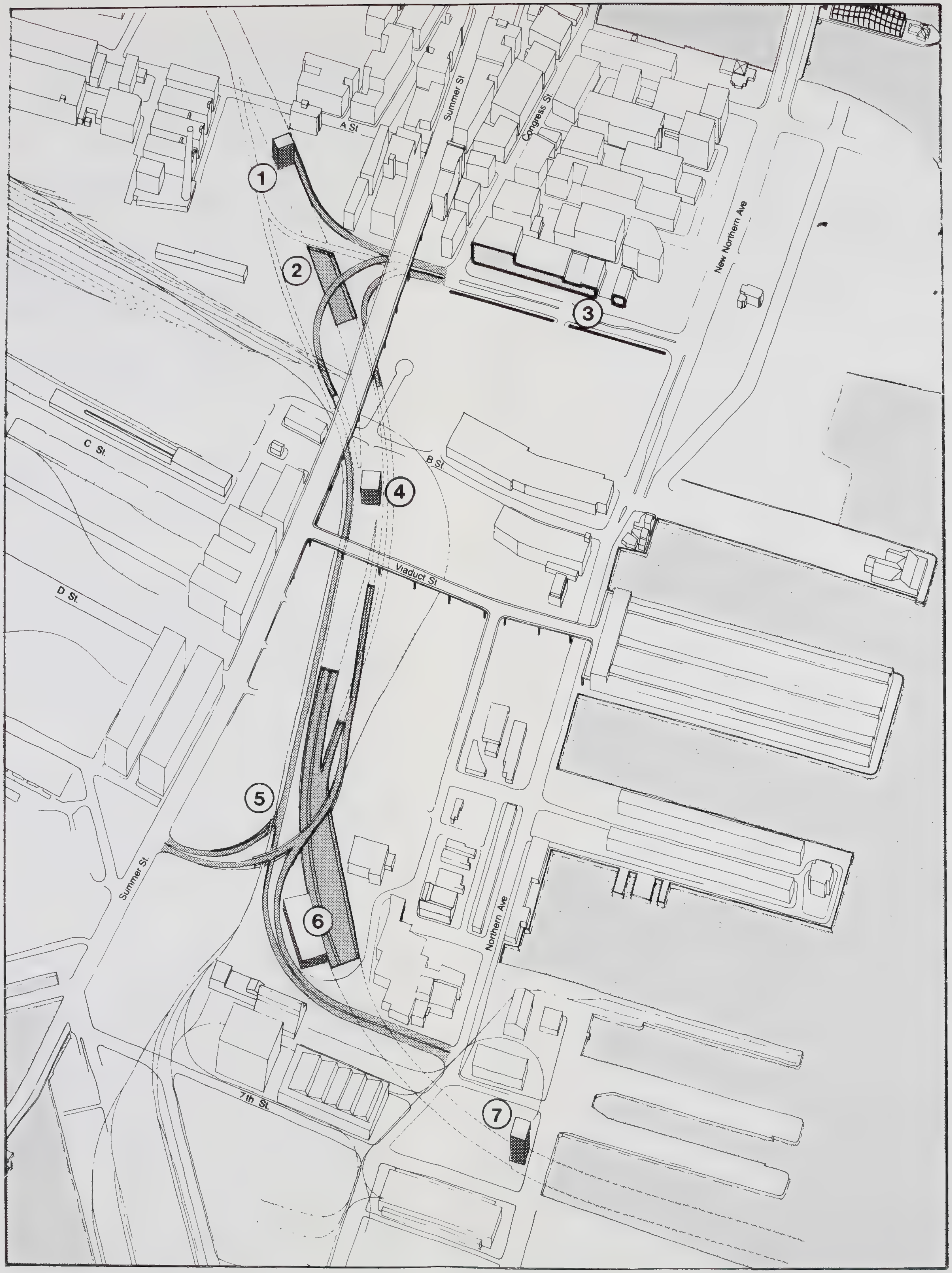
Architectural treatment of the ventilation building in conformance with existing buildings will minimize visual impacts on neighboring parcels.

Fort Point Channel

View from the Road

For those motorists approaching downtown Boston on New Dorchester Avenue, views of the Fort Point Channel and the Post Office will be dominant. Views of Fort Point Channel will be across a landscaped pedestrian walkway and will include any marina development which occurs in the Channel. The experience of entering Boston along this route will be reminiscent of the drive along Memorial Drive near the Longfellow Bridge in Cambridge.

The increased visibility of



Legend

- Ramps, and Open Sections
- Ventilation Buildings

South Boston – Summary of Aesthetic Impacts and Mitigating Measures

1. Ventilation building will be a prominent visual landmark from A Street and adjacent renovated buildings. Mitigating Measure: reduce height of structure, use special architectural treatment, and orient ventilation building to conform with existing street and building grid. Vent stack height may be altered based on additional air quality analysis.
2. Three new ramps and open tunnel section will be visible from adjacent buildings and Summer Street Bridge.
3. Wide right-of-way for new access road connecting the tunnel to Northern Avenue separates the existing Boston Wharf buildings from the future Cabot, Cabot & Forbes Development. Mitigating Measure (2 & 3): Modify the ramp and access the design.
4. Ventilation building will be a prominent visual landmark from Summer Street, Viaduct Street and B Street. Mitigating Measure: reduce height of structure and reorientate structure to minimize impact. Vent stack height may be altered based on additional air quality analysis.
5. New ramps are visible from adjacent buildings, Summer Street, Viaduct Street, Ramp Street and Massport properties.
6. Toll plaza is an open section visible from Viaduct Street and will be visible from future Massport development. View of Administration building will be obscured from surrounding streets by ramps and existing fisheries buildings.
7. Ventilation building will be a prominent visual landmark from the Harbor and will also be visible from Northern Avenue. Mitigating Measure: reduce height of structure and special architectural treatment. Vent stack height may be altered based on additional air quality analysis.

Figure 73

Summary of Aesthetic Impacts and Measures to Minimize Harm Preferred Alternative

South Boston

0 250 500 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

Fort Point Channel caused by the introduction of this roadway may enhance its potential for water-related development and will introduce many people to its existence as a unique urban waterfront area.

View of the Road and Pedestrian Environment

The project will cause changes in the visual and pedestrian character of Fort Point Channel. Although some of these changes are visually negative, the project will have the benefit of increasing accessibility to Fort Point Channel for pedestrians and increasing the Channel's visibility as an urban waterfront.

The visually negative impacts caused by the project are the loss of the existing parallel bulkhead lines, and loss of visible water area, particularly south of Summer Street.

The visual character of the Channel is different in the three areas defined by the bridges over the Channel. These visual differences will remain after the project. The specific changes to the western bulkhead line are described below and are illustrated in Figure 72.

o From the southern end of the Channel to a point 400 feet south of Summer Street, the New Dorchester Avenue and pedestrian walkway will project 40 feet further into the Channel than the existing bulkhead line.

o Within the 400 feet just south of Summer Street, a deck, slightly lower than New Dorchester Avenue, will be constructed on top of the tunnel box. This deck can be used for a variety of passive recreation uses (see Section 4.4.4 Joint Development). The deck plus Dorchester Avenue will project 80 feet into the Channel from the existing bulkhead line, and then taper inward toward the existing bulkhead. (See also Figure 66.)

The linear character of the Channel edge south of the Summer Street Bridge, which is defined by the parallel bulkhead lines, will be maintained. A new bulkhead line will be created and a new pedestrian deck will be developed below street level. A new bulkhead constructed of granite will be created. The introduction of the two-lane New Dorchester Avenue in this area will increase noise level in this area.

o Between Summer Street and Congress Street, the Channel is a small tightly defined space, with many bridge, utility and piling structures in the water. The project will reduce the water area slightly, but will improve pedestrian access to the water's edge, and thus facilitate the development of water-related uses.

North of Summer Street, the roadway and pedestrian walk project 4[illegible] feet from the existing bulkhead line adjacent to Summer Street, and taper in to be only 15 feet from the existing bulkhead line at Congress Street. The deck to be built in this area is similar to the one described above.

o North of the Congress Street Bridge, the Channel is occupied by the Tea Party Ship Museum, and its eastern bank is used heavily by pedestrians visiting the Children's Museum. The character of this area will be essentially unaltered by the project.

The project will require the filling of a small area just east of Russia Wharf (this filling is already planned by others), and will facilitate the development of pedestrian access and recreational amenities in the area. In this area, new Dorchester Avenue and the pedestrian walkway will project 10 feet into the Channel. 100 feet north of Congress Street the new bulkhead meets the existing bulkhead line.

The Central Artery

While the Central Artery passes through a number of distinct districts and neighborhoods, some effects of removing the viaduct are common to all

(see Figure 74):

Today, people walking under the y experience a dark environment the impact of vehicle noise and st is frequently intensified by iaduct; in the future, the ience of crossing or walking lel to the Artery Corridor will ke that of walking on a typical street, and the pedestrian onment will be greatly improved.

The establishment of a pattern imarily rectilinear parcels and ets will provide a better sense of ntation for both drivers and strians.

Removal of the overhead road- ramps, piers, and columns will -stablish visual continuity between s of the city which were severed he elevated highway construction ears ago. Removing ramps in the arket/North End area, and between Financial and Waterfront Dis- ts, will open up views which do presently exist; removing the deck pier supports from other areas allow clear views along cross- ts which intersect the corridor are presently obstructed by the cture.

Relocating the ramps connecting ace streets and the Central Artery alter surface traffic patterns volumes. The new Surface Artery carry the fuel and other hazard- cargo trucks which presently use elevated Artery, thus making them noticeable to pedestrians.

There will be several secondary al impacts when buildings are structed on parcels over the nel. Oblique views under the vated Artery will no longer be sible, as the new buildings will ck diagonal sight lines and channel views along the new surface street ridors. Views from existing ldings adjacent to the Artery ridor will be affected as well; the se of openness over and around the sting Artery will change as devel- ent occurs and the Artery corridor umes a physical character and density much like that of the adjacent districts.

o The experience of driving through or into Boston on the Central Artery will be radically altered when traffic on the existing elevated structure is placed in the new tunnel. From a strictly visual point of view, elevated highways offer two advantages:

1) Drivers entering Boston have the opportunity to see landmarks, select an exit ramp, and drive to their destination with a sense of its character and location in mind. Travel in a tunnel clearly precludes this sense of orientation.

2) The views from the elevated structure across the North End, into the Quincy Market, out to the Harbor, and up to skyscrapers of the Financial District offer a diverse visual experience for drivers crossing the city; this experience of changing vistas has been observed and commented upon by many, and would be lost if the highway were placed in a tunnel.

The aesthetic experience of driving in a tunnel is less desirable than that of driving on an elevated or surface road. Although there are examples of tunnels designed with particular concern for creating a pleasant environment, artificial lighting and views only of the roadway, tiled surfaces and other vehicles typically offer a meager experience in contrast to the open and visually rich environment on the surface.

However, the use of tunnel offers a balancing opportunity to improve the visual experience of driving on the new Surface Artery. The new street system will offer clear uninterrupted views along its length and along crossing streets at intersections.

o Today the elevated Central Artery is a continuous element in the landscape, and when it is removed, the open corridor will appear as a long linear open space. As the corridor is developed with buildings and public

Central Area – Aesthetic Impacts and Mitigating Measures

1. 150′ opening for ventilation of existing Dewey Square Tunnel could be overbuilt by air-rights development which would incorporate a ventilation system for the Dewey Square Tunnel.
2. Oliver Street pedestrian connection and visual corridor improved by depressing and covering of Central Artery.
3. Ventilation building would be a prominent visual landmark as viewed from Atlantic Avenue. Mitigating Measure: locate structure in less prominent location, possibly combining it with ventilation building at High Street, and incorporating the building envelope of future air-rights development, based on additional air quality analysis.
4. Open ramp affects views and quality of pedestrian environment along Atlantic Avenue Mitigating Measure: incorporate ramp into the building envelope of future air-rights development.
5. High Street visual and pedestrian corridor re-established by removal of ramps.
6. Broad Street visual and pedestrian corridor improved by the removal of ramps and overhead highway structure.
7. Ventilation building would be a landmark as viewed from Atlantic Avenue and adjacent buildings. Mitigating Measure: Locate structure to the south of High Street and combine with northbound on-ramp and ventilation building at Oliver Street into the building envelope of future air-rights development (see Note 3)
8. Removal of the elevated highway allows visual relationship between the Grain Exchange Building/Custom House Tower area and the Waterfront area.
9. Important visual and pedestrian links to the Waterfront improved by removal of the elevated highway structure.
10. Visual and pedestrian corridor between Quincy Market and Commercial Street improved
11. Open ramps affect views and quality of the pedestrian environment along Cross Street and within the air-rights parcel between the North End and the Blackstone Block/Quincy Market area Mitigating Measure: incorporate ramps into the building envelope of future air-rights development
12. Removal of elevated highway structure improves the North Street visual corridor
13. Ventilation building will be a prominent visual landmark. Mitigating Measure: incorporate ventilation building in a building envelope constructed above depressed Central Artery, based on additional air quality analysis. Give building special design treatment consistent with Section 106 Memorandum of Agreement.
14. Pedestrian and visual connection established between Haymarket/Quincy Market area and the Hanover Street/Cross Street area.
15. Direct pedestrian and visual corridor re-established
16. Open ramps affect views and quality of the pedestrian environment. Mitigating Measure: incorporate ramps into the building envelope of future air-rights development.
17. Pedestrian connection between the North End and Haymarket MBTA Station improved. Grade separated pedestrian connection between North End and MBTA station could also be provided
18. North Washington Street visual corridor re-established
19. Restoration of the original street grid re-establishes the visual form and pattern of the Bulfinch Triangle.
20. Causeway Street visual and pedestrian corridor improved by removal of elevated structure and ramps.

Pedestrian and Visual Corridors
Visual Corridors
Ramps
Ventilation Buildings Preferred Location (Subject to Air Quality Analysis)

Figure 74
Summary of Aesthetic Impacts and Measures to Minimize Harm Preferred Alternative
Central Artery from Congress St. to Causeway St.

0 200 400 Feet

spaces, the physical character of its blocks and streets will take the form of the neighborhood or district through which it passes. The potentially disruptive appearance of an oversize linear element will be replaced by an integrated urban streetscape.

The three ventilation buildings proposed along the Central Artery corridor between High Street and North Washington Street and the permanent ramps to and from the depressed Central Artery will cause aesthetic impacts on areas directly adjacent to them. The final locations for these ventilation buildings will be determined following additional detailed air quality analysis; architectural design will be consistent with the Section 106 Memorandum of Agreement. Impacts of these ventilation buildings and mitigating measures are described below. For further discussion of mitigating measures, see Section 4.4.4 Joint Development.

The description of aesthetic impacts in the area between the Dewey Square Tunnel and Causeway Street is presented by sub-area. The two important impacts noted below apply to each individual area.

- View from the Road. For motorists within the tunnel, the view will be of tiled surfaces and other vehicles, as described above.

- View of the Road. Views of the road will be greatly diminished as a result of the removal of the elevated Central Artery. The road will no longer be the dominant visual element in the area; rather, small portions of the project, such as ramps, will be visible from city streets.

Financial District: Central Artery - Congress Street to High Street

View from the Road

There will be new views of the city for motorists driving on the Surface Artery or on streets perpendicular to the Surface Artery. This will be particularly important for motorists approaching downtown via the new Northern Avenue Bridge. Under existing conditions, views of downtown are blocked by the Central Artery structure which is in a transition section between elevated roadway and tunnel. With the project, these drivers will have unimpeded views up Oliver Street into the heart of the Financial District.

View of the Road

The ramps to and from the depressed Central Artery will be open depressed sections parallel to the Surface Artery. They will resemble the ramps to and from the existing Dewey Square Tunnel.

The ventilation system for the Dewey Square Tunnel requires an open section 150 feet long between Pearl and Oliver Streets. This will be a negative element in terms of views from surrounding buildings. The ventilation building proposed for this area will be the most visible project element.

Pedestrian Environment

For pedestrians walking along the Surface Artery, the environment will be significantly improved in this area in terms of visual quality, air quality and noise levels as compared to the future No-Build Alternative.

The pedestrian environment will be enhanced by the opening of new views along Pearl, Oliver and High Streets. Oliver Street will be a through street, connecting to the new Northern Avenue Bridge, allowing for an at-grade pedestrian connection along Oliver Street to the proposed new bridge.

Mitigating Measures

The open tunnel section between Pearl and Oliver Streets could be covered by air-rights development

which incorporates a ventilation system for the Dewey Square Tunnel. The on- and off-ramps designed as open sections could also be enclosed in an air rights development on the newly created parcel.

The ventilation building to be constructed in this area will be located and designed following detailed air quality analyses. The design will be consistent with the Section 106 Memorandum of Agreement. The ventilation building may be incorporated into air-rights development above the depressed Central Artery.

Broad Street District: Central Artery - High Street to State Street

View from the Road

For motorists driving on the new northbound Surface Artery, a new visual environment will be created. The road will curve to the left as it approaches Harbor Towers, as it does today. With the elevated Central Artery removed, drivers will have a dramatic view of the Grain Exchange Building and the U.S. Customs House. Design guidelines to ensure that these sight lines remain open and that the heights of new buildings do not conflict with vistas opened by the removal of the Artery will be prepared (see Section 4.4.4 Joint Development).

View of the Road

The ventilation building adjacent to the northbound Surface Artery near High Street would be visible to pedestrians walking along the Surface Artery and to residents of the Harbor Towers Building.

Pedestrian Environment

The new Surface Artery will provide a pleasant experience for pedestrians walking above the depressed Central Artery, in contrast to existing conditions. Pedestrian crossings will be improved at all access points between downtown and the pedestrian esplanade along Long Wharf, the New England Aquarium, Harbor Towers and Rowes/Fosters Wharf. Milk Street will be continuous from the center of downtown to the Waterfront. High Street will cross the depressed Central Artery and connect with a 30-foot wide pedestrian access corridor established by the BRA design guidelines for the northern edge of the Rowes/Fosters Wharf parcel.

Uninterrupted views of the harbor are created from the Broad Street District along High, Broad, India, Milk and State Streets. The Broad Street sight line, currently obstructed by retaining walls, will be re-established in a manner consistent with the BRA's design guidelines for Rowes/Fosters Wharf.

The Broad Street Historic District will be visually and physically reconnected with the Waterfront.

Mitigating Measures

The ventilation building to be constructed in this area will be located and designed following detailed air quality analyses. The design will be consistent with the Section 106 Memorandum of Agreement. The ventilation building may be incorporated into air-rights development above the depressed Central Artery.

Waterfront/Quincy Market - State Street to Clinton Street

View from the Road

Removal of the existing Central Artery structure will provide drivers on the new Surface Artery with clearer sight lines and an improved orientation to the street pattern.

View of the Road

No visible portions of the Central Artery will be constructed in this area.

Pedestrian Environment

The "Walk-to-the-Sea" will be

enhanced by a pedestrian easement across the new parcel created over the depressed Central Artery. Pedestrian actuated signals will allow safe and convenient access across the Surface Artery. The visual connection between the market area and the harbor will be re-established. As buildings are developed on air rights over the depressed Central Artery, views will be channeled along streets and pedestrian corridors. State Street's historic function as an important link connecting Long Wharf to Boston's commercial center will be enhanced by the removal of the Central Artery.

North End/Haymarket - Clinton Street to Endicott Street

View from the Road

Motorists travelling on the Surface Artery will have views of Boston's most historic neighborhoods, the North End and the Blackstone Block. New development on parcels above the depressed Central Artery should provide view corridors across the depressed Central Artery. New buildings constructed on air-rights parcels should be designed to assure adequate sight lines at intersections and to re-establish the building pattern.

The new Surface Artery and ramps to the Sumner and Callahan Tunnels, with proper signing, will make these areas clearer and more understandable to the driver.

View of the Road

The ramp from the Central Artery northbound to the Surface Artery (in the vicinity of North Street) is placed on the side of the street away from the North End. It will be visible from the street, but should not be very obtrusive. The ramps permitting access from the north into the Sumner Tunnel and into the Central Artery southbound will be placed in the center of the air-rights parcel over the depressed Central Artery, and their visual and noise impacts will be masked by new development placed around them (see Section 4.4.4 Joint Development).

The ventilation building to be located in this area would be visible to pedestrians and motorists, and may be larger than most structures in the area.

Pedestrian Environment

This portion of the Central Artery corridor has a high volume of pedestrian movement between the North End, downtown and the Quincy Market area. Removal of the elevated structure will provide the large number of residents, shoppers and tourists with more pleasant routes, open to the sky. The existing Central Artery southbound off-ramps and northbound on-ramps totally block cross-corridor views under the Artery and restrict pedestrian access. With the construction of the depressed Central Artery, sight lines across the corridor will be opened at Hanover, Salem, and North Streets.

A diagonal pedestrian walk connecting North and Hanover Streets will be built across a newly-created parcel. This walk will serve the large number of pedestrians wishing to cross between downtown and the North End. The 17th Century Blackstone Block will be physically and visually reconnected with the North End, and a street pattern similar to the original layout will be re-established.

A significant improvement in the pedestrian environment will occur as a result of the reconfiguration of the Surface Artery which will provide pedestrians on the east side of Cross Street with a pedestrian walk over the covered portals of the Sumner and Callahan Tunnels and signalized street intersections at Commercial and Fulton Streets. This area is currently a dangerous and obstructive element to pedestrian circulation in downtown Boston.

Mitigating Measures

The ventilation building to be

constructed in this area will be located and designed following detailed air quality analyses. The design will be consistent with the Section 106 Memorandum of Agreement. The ventilation building may be incorporated into air-rights development above the depressed Central Artery.

The exit ramp from the northbound Central Artery tunnel to the Surface Artery, running parallel to Cross Street, could be enclosed in a building envelope to enhance the appearance of these newly-created parcels.

Haymarket Square

View from the Road

Haymarket Square will be the focal point for drivers entering Boston from the north via North Washington Street, Interstate Route 93 and the Mystic-Tobin Bridge, and from the Sumner Tunnel exit to downtown Boston. The strict channelization of traffic which has been built into the design of this busy intersection will clarify movements for motorists approaching from many directions.

View of the Road

The Haymarket intersection will carry such significant volumes of traffic that a large expanse of paved area is necessary. The many movements occurring in the area will require many directional signs which will require careful design to avoid contributing to visual clutter.

The views of this area from the North End will be buffered by development on the parcel between the Surface Artery and Stillman Street.

Pedestrian Environment

Currently, pedestrians crossing the North End to the Haymarket MBTA station have to work their way around local and regional traffic under the Central Artery. The new Surface Artery will provide some safe, direct crossings with pedestrian traffic signals.

North Station/Bulfinch Triangle - North Washington Street to Causeway Street

View from the Road

Motorists driving on the northbound Surface Artery will be adjacent to handsome 19th Century industrial buildings; motorists on the southbound Surface Artery will have views of the Blackstone Block and the area around Quincy Market. On this portion of the Surface Artery drivers will be on a roadway which forms a logical street pattern with adjacent city streets, thus enhancing the sense of orientation.

Drivers entering Boston on North Washington Street will have improved sight lines into downtown Boston.

View of the Road

When the Central Artery viaduct is removed, the physical and visual character of the North Station/ Bulfinch Triangle will be altered dramatically. Haverhill Street will be reconstructed to Haymarket Square, which will improve vehicular circulation and open views of the U.S. Customs House and downtown. Views will also be reopened between North Washington Street and downtown and along Traverse Street. With the reconstruction of Beverly and Traverse Streets, the physical layout of the Bulfinch Triangle will be re-established.

Pedestrian Environment

The elevated Central Artery is a major barrier to pedestrian movement in this area. With the removal of this structure, many impediments to sunlight, circulation, and activity will be eliminated. Causeway Street will become visually continuous, with only the single bridge of the relocated Green Line crossing the roadway overhead. (The MBTA is evaluating Green Line relocation options which may result in this bridge crossing

being removed.) Controlled sections at Haverhill and Beverly ets will ease pedestrian movement, ntrast to the free-moving vehicle s that exist today. Development ew parcels along Causeway Street increase street-level activity, her improving the pedestrian ronment. The project will provide opportunity to create a landscaped on MBTA-owned land adjacent to new southbound Surface Artery.

Views along North Washington et are currently obscured due to rising of the street and the low, que crossing of the elevated cture. This important corridor een Charlestown and downtown will e-established, greatly improving present pedestrian environment. lopment of parcels created along se routes will also improve the estrian environment.

h Station/Charles River - Causeway eet to Charles River

View from the Road

North of Causeway Street the tral Artery will emerge from a nel and rise onto bridges over the rles River. For northbound motor-s this will be the first opportun- to view surrounding areas since ering the depressed Central Artery.

Views available to drivers ering Boston on southbound Inter-ate Route 93 are presently blocked the overhead northbound structure. e new northbound and southbound idges will be separated, so inbound torists will have a dramatic vista downtown Boston before they enter e Artery tunnel, with sightlines cused on the U.S. Customs House wer. Northbound motorists will have ews across the Charles River to arlestown and Bunker Hill, as they erge from the tunnel. The rising ofile of the bridge will inhibit is view to some extent.

View of the Road

Just north of Causeway Street, the Central Artery will emerge from the tunnel onto a ramp on retained fill, rising to meet the new bridge across the Charles River. This roadway section will be visible from Causeway Street, the Hoffman Building to the east, the vacant parcels to the west, and the banks of the Charles River. Two open ramps connecting the Central Artery and Storrow Drive will be visible from the proposed MDC walkway along the Charles River; one of these is near the Interstate Route 93 southbound bridge, the other near Leverett Circle. An additional ramp will allow traffic traveling from the south on the Central Artery to connect to the surface at Leverett Circle with movements to Cambridge. This ramp will require the relocation of the bulkhead and also will interrupt the proposed MDC walkway (for a more complete discussion of these impacts see Chapter 5.0 SECTION 4(f) EVALUATION). Design refinements currently underway for this area indicate that it may be possible to move the ramp inland, thus eliminating this impact.

As presently designed, the bridges across the Charles River will require six steel trusses approximately 60 feet in height. Their location will make them an important visual element in the Charles River area, and they will have negative visual impacts on the proposed MDC linear parks and buildings in the area. A ventilation building will be located next to the MDC dam access road, and will also be a prominent visual element.

The overall impact of the project in this area will be significant. Roadway elements will be closer to the ground and will affect views across and along the banks of the Charles River (see Figure 75).

Pedestrian Environment

The roadway and sidewalk between Causeway Street and the Charles River Dam will no longer pass under an elevated structure; rather, it will parallel an open roadway section which is rising to meet the

bridges across the Charles River. The bottom of the roadway will be only 15 feet above the edge of the Charles River, and will create a darker and less attractive river bank than currently exists. Noise and air quality will be worse than they are at present. The relocated MDC access road connecting Causeway Street and the Charles River Dam will be designed as an attractive landscaped pedestrian way connecting the North Station area and downtown to Charlestown via the new Charles River Dam. A noise barrier which will also serve as a visual buffer between the Central Artery ramps and the walkway will decrease the impacts of the project on this walkway.

The ramps connecting the Central Artery and Storrow Drive near Leverett Circle will affect the plans for a continuous walk along the Charles River between the new and old Charles River Dams. The ramps will preclude the connection of a riverbank walkway to the adjacent land areas for a distance of approximately 775 feet. Design refinements currently underway for this area indicate that it may be possible to move the ramp inland, thus eliminating this impact.

Views from Causeway Street to and across the Charles River will be improved. A sight line to City Square and the Bunker Hill Monument will be created.

Mitigating Measures

The bridges across the Charles River will be designed as attractive structures which add visual interest to the area; for example, they could be suspension or static cable bridges. The details of this mitigation must be developed during the design phase. Minimizing the bulk of structural members will reduce impacts on views across the Charles River and make the structures appear lighter.

The ventilation building to be constructed in this area will be located and designed following detailed air quality analyses. The design will be consistent with the Section 106 Memorandum of Agreement. The ventilation building may be incorporated into air-rights development above the depressed Central Artery. The site of the Charles River Building will be developed as open space and will provide an extension of the pedestrian walkway along the Charles River (design modification work now underway suggests that a ramp redesign in the area may obviate the need to take this building).

Careful design of column and pier spacing will reduce impacts on views. Mitigating measures will include provision of landscaping on top of the below-grade ramp connecting the Central Artery and Storrow Drive.

Logan Airport

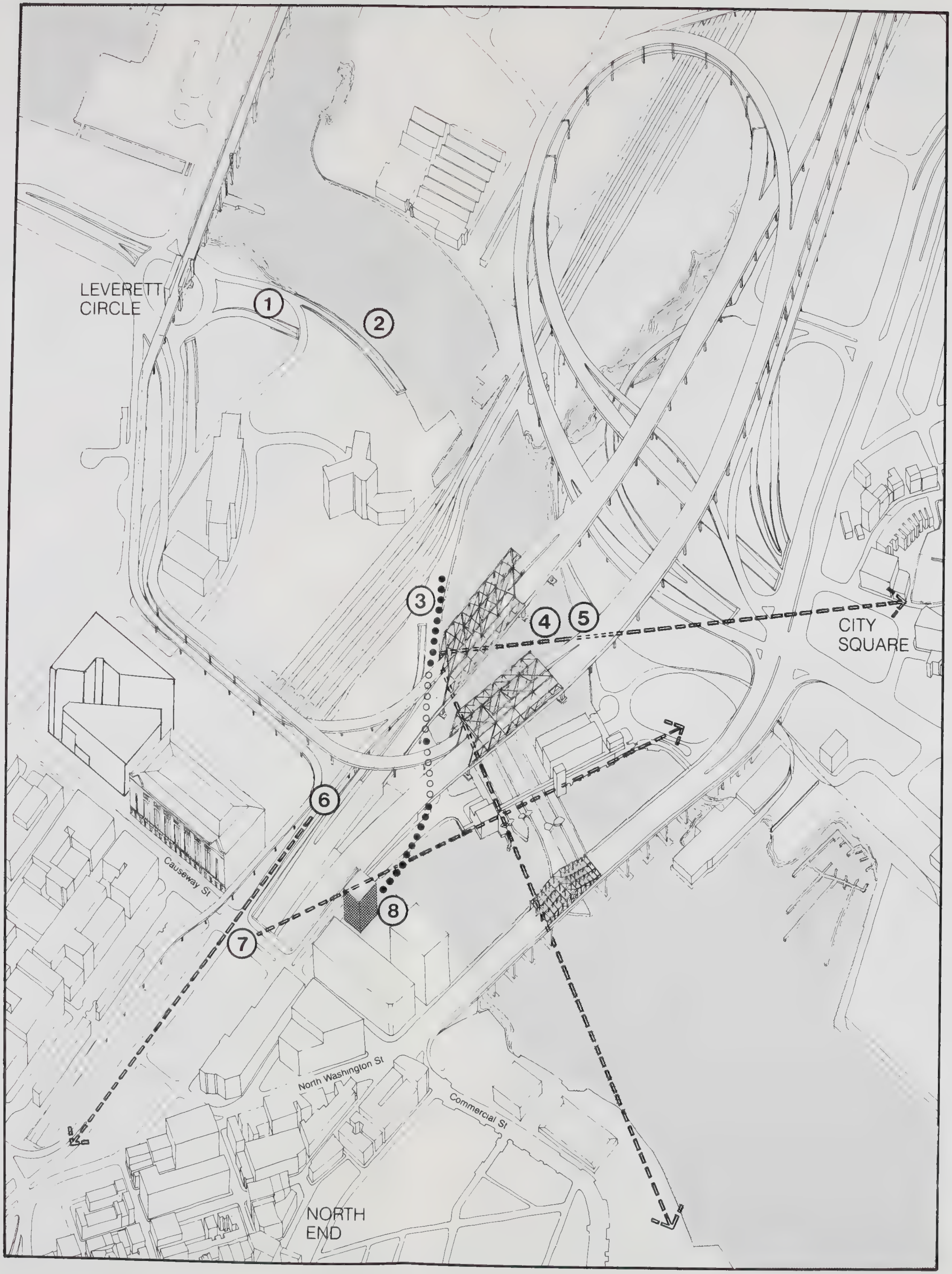
View from the Road

Motorists in the Third Harbor Tunnel will remain underground until tunnel ramps merge with the Airport access and egress roads. From that point on, the view from the road will be very similar to what it is today. The realignment of the Airport egress road, to the site of the existing service road, will slightly shift the views which motorists have.

Currently, motorists enter the Airport on a ramp which descends to an at-grade intersection, and have views of the terminal area and the Control Tower at all points along the way. As a result of the project, motorists proceeding into the Airport will descend into an underpass at the site of the existing at-grade intersection and will then quickly re-emerge to a decision point. Motorists leaving the Airport will have a similar experience.

View of the Road

The project includes ramps and ramp portals in the Southwest Service area, the North Service area, adjacent to the Hilton Hotel and adjacent to the East Boston Memorial Stadium (see Figure 76). These elements will not have significant visual impacts on



Legend

Ventilation Buildings

Pedestrian Connection

Views

North Area – Aesthetic Impacts and Mitigating Measures

1. Surface street alignment and open ramps conflict visually with MDC Charles River Basin walkway and initial BRA Phase II redevelopment plans. Mitigating Measure: Refine surface street design and visually screen open ramps with walls and landscaping
2. Open ramp affects MDC proposal for Charles River Basin Walkway cutting off access to the water. (Design refinements currently underway for this area indicate that it may be possible to move the ramp inland, thus eliminating this impact.) Mitigating Measure: Granite facing on new bulkhead parallel to ramp. A pedestrian walkway could be added to the face of the bulkhead.
3. Views from MDC Charles River Basin walkway to Bunker Hill Monument, USS Constitution, and Copps Hill are limited by new bridge structures.
4. New bridges, wider and lower than the existing structure, will cast shadows over more of the Charles River Dam walkway and the Charles River Basin walkway. Low head room under bridges will alter pedestrian experience.
5. The design of the two new bridges should reflect the visual prominence of their location.
6. Dramatic views of downtown Boston and Customs House Tower for motorists entering on the southbound off-ramp.
7. Removal of overhead structure opens views from Causeway Street to Charlestown and Charles River Dam. Ramps and tunnel portal dominate views.
8. Ventilation building is a prominent visual feature from bridges and along Charles River Basin walkway. Mitigating Measure: change height of structure based on additional air quality analysis and use special architectural treatment to minimize its visual impact consistent with Section 106 Memorandum of Agreement.

Figure 75
Summary of Aesthetic Impacts and Measures to Minimize Harm Preferred Alternative
North Station/Charles River Area

0 200 400 Feet

Legend

Ramps, and Open Sections

Ventilation Buildings.

Logan Airport – Aesthetic Impacts and Mitigating Measures

1. Ventilation building will be visually prominent from Massachusetts Technology Center. Mitigating Measure: reduce height of structure and use special architectural treatment. Vent stack height may be altered based on additional air quality analysis.
2. Addition of southbound Third Harbor Tunnel access ramp and grade separation of Airport service road affects motorists' visual orientation.
3. Open ramps and tunnel traffic increases noise and visual impacts on Memorial Stadium. Mitigating Measure: Acoustical barrier incorporated with landscaping can provide a suitable noise and visual buffer.
4. New ramps will be visible from adjacent Airport hotel.

Figure 76
Summary of Aesthetic Impacts and Measures to Minimize Harm Preferred Alternative
Logan Airport

0 250 500 Feet

:ent uses.

The ventilation building to be :ructed on Bird Island Flats will ɔst visible to occupants of the achusetts Technology Center. ough the ventilation building will be significantly different in e from surrounding buildings, it be different in appearance. The ilation building will be screened the residential community on ries Point by the Massachusetts nology Center.

Pedestrian Environment

The pedestrian environment at Airport is almost entirely conned within the terminal area and l therefore not be affected by the ject. The Bird Island Flats erfront Park will not be affected the project.

The East Boston Memorial dium will be further from the port egress road following complen of the project, and environmental lity at the stadium will improve. oise barrier will be constructed at Stadium as indicated in Section .1. NOISE AND VIBRATION IMPACTS.

In addition to the replacement land used for construction, the oject will compensate for construcon impacts, including enhancement of e entrance from Porter Street into e Stadium area. This easement, rrently existing, has not been fully erational in spite of its existence the time of the various land ansfers which created the park area 1954. See Section 5.1.1 East Boston Memorial Stadium for further inormation.

Mitigating Measures

In order to maximize improveents to the East Boston Memorial tadium, the parcels created adjacent o the Stadium will be used to create buffer between the stadium faciliies and the roadways. Earth berms ill be built to buffer both visual mpacts and noise impacts of the roadays. Effective landscaping will create a significant improvement in the environment at the stadium.

The ventilation building located on Bird Island Flats will be designed to reduce its visual impact on the Massachusetts Technology Center.

4.17 ENERGY

Transportation consumes the most rapidly depleting form of energy -- petroleum. It also accounts for a significant portion of overall energy consumption.

Transportation-related energy is usually separated into two main categories: "Direct", defined as the energy consumed in the actual propulsive effort of a vehicle, such as the thermal value of the fuel, and "Indirect", which is all the remaining energy consumed to operate a transportation system.

Indirect energy may be divided into two main subcategories: central energy use and peripheral energy change. Central energy use encompasses all the energy resources used indirectly in constructing and operating a transportation system. It addresses the fact that energy must be expended to create and support a transportation system; for example, energy consumed in mining and refining raw materials into useful products such as vehicles or roadways.

Peripheral energy change recognizes energy resources that are not used in any manner by the system itself. Rather, it addresses the potential effect that a transportation system may have on energy use and availability in the area it services. Peripheral energy consumption effects will be negligible for reasons outlined in the Supportive Engineering Report.

There is no formal statewide or regional transportation energy plan.

4.17.1 Comparison of Alternatives

Differences in total energy consumption is negligible amongst all

alternatives. As compared to the No-Build Alternative, about 15,000 barrels of oil would be saved with Alternative 5, which has the least energy consumption; the Two-lane Tunnel Concept has the worst energy consumption effects, with about 145,600 additional barrels of oil used on an annual basis. In general, the energy cost to construct the various alternatives slightly outweighs the energy saved by improved traffic operations. Table 69 presents a comparison of the total daily barrels of oil consumed with each alternative.

4.17.2 Preferred Alternative

The Preferred Alternative will require a substantial one time energy expenditure related to the construction materials, operations, and equipment; this alternative will also require maintenance after construction, and the depressed Central Artery will involve substantially greater operating costs than the existing elevated roadway because of ventilation requirements. On an annual basis, this alternative consumes about 77,700 more barrels of oil than the No-Build Alternative, even though the traffic flow will be improved relative to the No-Build Alternative. This is due to the additional traffic induced by the Project.

The major input for the direct energy calculations (volumes and distribution of traffic) for the Preferred Alternative and the No-Build Alternative are detailed in Section 4.2 of this FEIS/FEIR and summarized in Chapter 10.0 ENERGY ANALYSIS, in the Supportive Engineering Report. Vehicle-miles and vehicle-hours of travel used in the energy analysis are for the design year (2010).

The No-Build Alternative, which includes redecking of the Central Artery, also entails the expenditure of energy during construction. The end product of the construction is a facility which will not significantly improve traffic operations or decrease congestion on the Central Artery. Increased traffic congestion will cause an increase in fuel consumption of a portion of the total vehicles operating in the project area.

Table 70 provides the results of the energy analysis in terms of equivalent annual energy consumption for the Preferred Alternative and the No-Build Alternative for the design year. Construction energy and vehicl indirect energy values have been pro-rated according to estimated useful lives (100 years for tunnels and ventilation buildings; 50 years for bridges; 25 years for pavement, subbase, drainage structures, etc.; 10 years for landscaping), thus providin meaningful comparisons.

The results in Table 70 indicate that the Preferred Alternative i somewhat more energy efficient than the No-Build Alternative in Direct Energy consumption, but uses more energy for its construction than the No-Build Alternative. Overall, the net effect is a slight increase in energy consumption due to the build alternative (on the order of two percent). A difference of this magnitud indicates that implementation of the Preferred Alternative will not have a significant negative impact on overal energy consumption.

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

With both the No-Build Alternative and the Preferred Alternative, there will be irreversible and irretrievable commitments of resources, although to varying degrees. Both alternatives will require the continued expenditure of human and socia resources for the planning, design, and construction of the highway improvements. Because of the significant differences in the extent of construction, the Preferred Alternative's commitments to these resources is much greater than for the No-Build Alternative; however, these resources are not in short supply, particularly in the Boston area, and do not represent a significant adverse impact. The consumption of these resources in a productive manner, particularly for the

Table 69

SUMMARY COMPARISON BY ALTERNATIVE OF ENERGY CONSUMPTION

Alternative	Total Energy In Terms of Equivalent Barrels of Crude Oil Per Day	% Energy Consumption Compared with No-Build Alternative
No-Build	15,177 Bbl	-----
2	15,139 Bbl	- 0.25
3	15,153 Bbl	- 0.16
3A	15,319 Bbl	+ 0.94
4	15,134 Bbl	- 0.28
5	15,186 Bbl	+ 0.06
5A	15,224 Bbl	+ 0.31
Preferred	15,390 Bbl	+ 1.40
6	15,153 Bbl	- 0.16
Two-Lane Tunnel	15,576 Bbl	+ 2.63

Table 70

ANNUAL EQUIVALENT ENERGY CONSUMED (BTU's)

Direct Energy	No-Build Alt.	Preferred Alt.
Cars	9.118×10^{12}	8.907×10^{12}
2-Axle, 6-Tire Trucks	3.638×10^{12}	3.556×10^{12}
Tractor-Semitrailer Trucks	3.018x1012	2.949x1012
Total, Direct Energy	1.577×10^{13}	1.542×10^{13}
Indirect Energy		
Vehicle-related	1.632×10^{13}	1.640×10^{13}
Facility Construction	3.564×10^{10}	4.633×10^{11}
Facility Maintenance	1.01×10^{9}	9.517×10^{9}
Power	0	2.870x1011
Total, Indirect Energy	1.636×10^{13}	1.716×10^{13}
Total Energy Expended Annually:	3.213×10^{13}	3.258×10^{13}
Total Energy in terms of equivalent barrels of crude oil per day:	15,177 Bbl	15,390 Bbl

referred Alternative, is offset by the non-productive time wasted by millions of motorists as they would sit in traffic congestion of 10 - 14 hours day with the No-Build Alternative.

Construction of either alternative also requires consumption of tangible raw materials. For the No-Build Alternative, commitment of these resources is minimal, particularly with respect to the Preferred Alternative, since redecking of the existing Central Artery does not require construction of totally new facilities. The materials consumed by the Preferred Alternative include thousands of tons of steel and concrete, millions of yards of gravel and fill, energy, and other natural resources. However, this does not represent a significant impact on natural resources since these materials are readily available. As noted throughout this Chapter 4, the Preferred Alternative results in significant long-term benefits to the motorists using the highway facilities and to most of the neighborhoods (in terms of quality of living), partially offsetting the use of these resources. Removal of the existing Central Artery viaduct, as part of the Preferred Alternative, will also allow the salvage and reuse of the steel for other purposes. The concrete deck of the Central Artery, as discussed previously, will also be removed in large panels, rather than pulverized, and could thus be used for such purposes as shore protection in coastal areas now experiencing erosion due to ocean currents, etc. The clay material excavated from below the existing Central Artery can also be used, subject to testing, for capping a number of existing sanitary landfills in the Commonwealth.

The No-Build Alternative results in the continued, irreversible and irretrievable commitment of the highway right-of-way for highway purposes. This commitment also maintains a blighting and divisive highway facility in the downtown area. The Preferred Alternative removes the elevated facility from the area between Dewey Square tunnel and Causeway Street and allows for the development of approximately 20 acres of air rights in this area. This air rights development will be beneficial to the City of Boston as a whole and can also reconnect the adjacent neighborhoods previously severed by construction of the Central Artery. As presently configured, the Preferred Alternative results in the displacement of water and (State-defined) wetlands in the Fort Point Channel and the Charles River, although the effect of this displacement on flooding, marine ecosystems, and water quality is expected to be negligible. Design refinements underway at this time suggest this negligible effect could be reduced further.

In summary, the Preferred Alternative requires an irreversible and irretrievable commitment of natural resources for construction and operation of the highway facility. This potentially adverse impact is offset by the major transportation, economic and environmental benefits (air and noise improvements) which will accrue to the Boston area with implementation of the Preferred Alternative.

4.19 SHORT-TERM USES OF THE ENVIRONMENT VS. LONG-TERM PRODUCTIVITY

4.19.1 No-Build Alternative

The No-Build Alternative's short-term effects will occur over an approximate three year construction period required to redeck the existing Central Artery, including the High-Level Bridge over the Charles River. As discussed throughout Chapter 4 of this FEIS/EIR, this alternative's short-term effects are expected to be significant, particularly for regional traffic flow through the Boston CBD area. Loss of capacity on the Central Artery during redecking will significantly affect the movement of people and goods through the CBD because of the inability to maintain six lanes of Central Artery traffic flow during this period. Loss of capacity on the Surface Artery, also due to the construction technique of deck removal, will adversely affect the flow of

local and regional vehicular traffic and pedestrians on the surface street system. Parking along the Surface Artery and in the lots under the Central Artery will also be lost during the redecking procedure. It is likely that this construction would result in traffic diversions to other, more circuitous routes, including increased use of neighborhood streets, thus increasing potential for accidents and competition for on-street parking, and adversely affecting the quality of life in these neighborhoods. Increased congestion on the highway and roadway facilities can also lead to losses in revenues, sales, etc. from the local and regional economy.

In the long-term, the No-Build Alternative will not meet the transportation needs of the Boston area. Traffic congestion will increase to approximately 10 to 14 hours a day, resulting in an additional 17.6 million person hours of travel for motorists on the network as compared to the Preferred Alternative. This significant increase in congestion and VHT has major adverse effects on air quality, economics, and quality of life for residents in the Boston area. This alternative will not allow creation of approximately 20 acres of prime developable lands in the downtown area, and thus significantly reduces the potential for additional revenues to the City and the State. This alternative will not create the many employment opportunities that will result from the Preferred Alternative.

4.19.2 Preferred Alternative

The construction period for the Preferred Alternative, particularly for depression of the Central Artery, is approximately 12 years (4 times longer than the No-Build Alternative). Although the construction period is significantly longer, the Preferred Alternative has been developed in a manner which minimizes the construction period impacts on the environment. It maintains the full capacity of the elevated Central Artery while the new depressed facility is being constructed, and maintains six lanes of moving traffic on the surface where there are now eight lanes (Surface Artery and Atlantic Avenue combined). A separate construction haul road under the Artery will reduce the effect of construction equipment on local traffic flow. Traffic management will assure traffic flow during construction.

Parking lots under the Central Artery will be replaced in alternative sites, possibly in a new garage, prior to their being displaced by the project. Potential neighborhood impacts, such as increased use of local streets by construction vehicles, will be controlled by strict contract specifications.

Noise and vibration effects of the construction activities, particularly at sensitive receptors along the construction site, will be minimized by specifications controlling the allowable times and criteria for certain construction activities. Temporary noise barriers, muffle red construction equipment, and limits on the times when noise-producing activities (such as pile driving, jackhammering, etc.) can be accomplished will control the potential adverse noise and vibration impacts.

Air quality effects during construction, caused by traffic detours and the construction activities themselves, will also be minimized by design and construction specifications. When detour routes are better defined, construction period air quality analyses will be performed. It is expected that changes to existing traffic controls and geometric modifications may be necessary (for example, changes to traffic signal timings and/or installation of temporary signals, removal of on-street parking in certain ares, curbing and pavement marking changes, etc.). Tarpaulins or other suitable covers will be required on trucks hauling excavated materials, and other measures such as wetting of exposed earth and use of dust control agents, will be required by the construction specifications. Conformance to City

of Boston and State air quality requirements must be assured by the project.

Siltation of the Fort Point Channel and Charles River during dredging operations will also be controlled by use of silt curtains, sheet steel cutoff walls, etc. Dredging across Boston Harbor will result in turbidity in the harbor, although the impact is expected to be minor. Underwater blasting of rock in the South Boston/BMIP area will be controlled by special techniques, such as small charges, pre-drilling of charge holes, and other measures, to minimize vibration and marine life impacts.

Groundwater levels will be monitored and corrective measures taken as necessary during the construction period to minimize the project's effects on the groundwater table. Other construction period effects, such as the potential influx of rodents to adjacent buildings caused by the construction activities, will be controlled by approved techniques described in this document.

In the long-term, the Preferred Alternative results in significant improvement in transportation service and development opportunities for the Boston area. This transportation benefit includes a savings of approximately 17.6 million person hours of travel. The Preferred Alternative substantially improves the movement of people and goods to Logan Airport, resulting in economic benefits to the region. The level of Airport activity (passengers, airline operations, development, etc.) is not expected to be affected by the project, but is more a function of regional and national economic forces.

The Preferred Alternative removes significant volumes of traffic from neighborhood roadways, particularly in the North End, Chinatown and South Boston areas. This major benefit of the project will significantly improve the quality of life in these neighborhoods. In South Boston, the project also removes substantial volumes of truck traffic (hazardous cargo) from the residential streets.

Improvements in air quality and noise and vibration characteristics of the project area will also accrue from implementation of the Preferred Alternative, due to improvements in traffic flow, placement of the large volumes of traffic in tunnels, and removal of the existing Central Artery viaduct.

Removal of the existing Central Artery viaduct will also improve aesthetic conditions in the area, will allow reconnection of the downtown and adjacent neighborhoods long severed by the elevated Central Artery, and will allow joint development of approximately 20 acres of air rights above the depressed Central Artery. These improvements will also result in significantly increased tax revenues and employment opportunities in the area.

Removal of the viaduct will also enhance the historic character of a major portion of downtown Boston.

The historic Fort Point Channel will be enhanced by the public amenities to be included as part of the Preferred Alternative. Public access to the waterfront area and the aesthetic experience of walking along the Channel will also be improved.

The East Boston Memorial Stadium at Logan Airport will also be enlarged and enhanced as a result of the Preferred Alternative. This intensively-used recreational facility will experience noise level reductions as a result of a new noise barrier to be constructed along a portion of the Airport access, egress, and Cross Roads. Landscaping improvements are also to be provided.

In summary, the Preferred Alternative includes specific, extensive measures to mitigate potential adverse impacts and commitments to evaluate further unresolved issues. With these commitments, the construction period impacts will be minimized to the extent possible while the long-term productivity of the environment is enhanced.

Section 4(f) of the Department of Transportation Act of 1966 prohibits use of land from a significant publicly-owned park, recreation area, or wildlife or waterfowl refuge or any significant historic site unless it can be shown that (1) there are no feasible and prudent alternatives to the use of the land from the property; and (2) the proposed action included all possible planning to minimize harm to the property resulting from such use.

5.1 PARKLANDS

There are three recreation areas affected by the Preferred Alternative which are subject to Section 4(f) requirements.

5.1.1 East Boston Memorial Stadium

Description

This recreation area totals 17.67 acres. It has a northwest-to-southeast orientation and is located between the inbound and outbound Airport access roads east of Route 1A. The park includes an additional parcel of 50,400 square feet located southwest of the inbound Airport roadway (see Figure 77). The latter parcel has been augmented by approximately 26,000 square feet of adjacent land leased from Massport.

The facilities include a softball field, baseball field and 4,900-seat football stadium, all of which have floodlighting for evening use. The stadium building contains offices, shower rooms, a first aid station, locker facilities and a maintenance depot for the owner, the Boston Parks and Recreation Department. A track, basketball courts and a tot lot with wading pool, swings, slide and jungle gym are also provided. Tennis courts lie at the southeastern end of the field.

The parcel southwest of the inbound roadway has two street hockey courts and parking spaces demarcated.

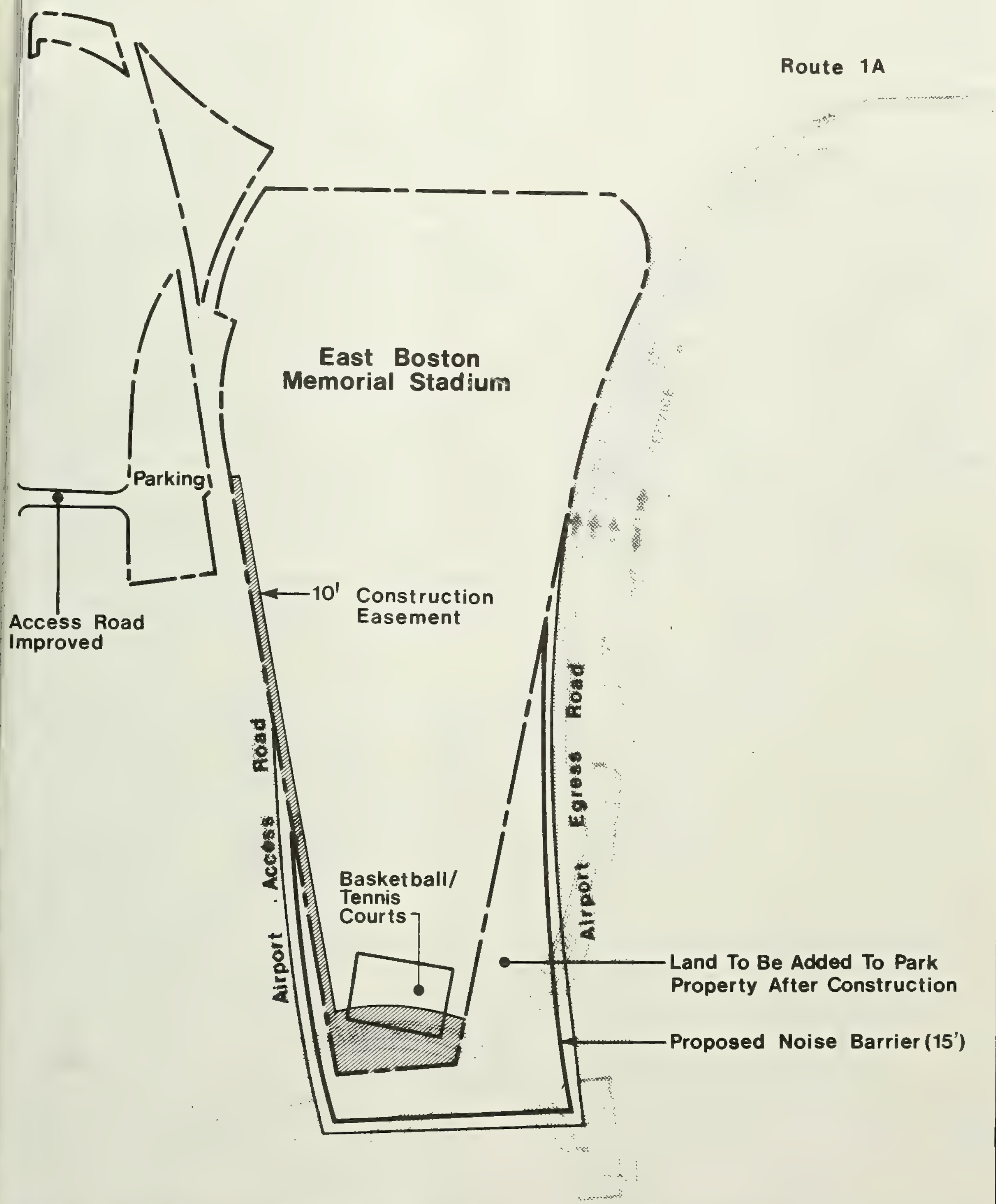
All facilities in the stadium complex are heavily used. It is the only East Boston park with a single-use football field, and one of only four East Boston parks with floodlights. The three other floodlit parks are located throughout East Boston and serve different neighborhood groups.

In addition, the stadium playfields are a city-wide and regional resource. The football field is the home field for East Boston High School games and practice. It is also used by eight Boston Park League football teams, and by 1,200 boys in the East Boston Youth Athletic Association football program. The football field is used for competition by two state-wide soccer associations which play over four games per week in season. It is also used for a city-wide summer recreation program for handicapped and emotionally disturbed children which daily serves over 300 children.

The baseball and softball facilities are used as home fields for East Boston High School, by 16 baseball and 22 softball teams in the Boston Park League, and by the East Boston Girls' Softball League. Most of the airlines at Logan Airport have a team in the Massport League which has softball games two nights per week. In addition, the East Boston Little League maintains a separate baseball diamond within the stadium complex.

In spite of limited play facilities, the tot lot and wading pool area are heavily used. East Boston Social Centers, Inc. uses the area as part of its summer Day Care Center program, which serves hundreds of children each day.

The Boston Parks and Recreation Department recently considered entering into an agreement whereby a private parking lot operator would maintain the stadium and grounds in exchange for the exclusive right to



Construction Easement (permanent subsurface easement at tunnel layout lines)
Park Boundary
Tunnel or New Roadway

Figure 77
East Boston Memorial Stadium – Impacts Under the Preferred Alternative

0 125 250 Feet

use the 140-space parking area southwest of the inbound roadway. Although parking spaces were demarcated, this arrangement was never implemented; the parking area is now closed to the public and cannot be used as a point of access into the park.

The recreation area was transferred to the City of Boston in 1954 by the Commonwealth of Massachusetts in exchange for the City-owned Amarena Playground, acquired by the Commonwealth for Airport expansion. Approximately one third of the stadium's parking area is located on a contiguous parcel leased for an indefinite term from Massport. The Boston Parks and Recreation Department has also been given easements across the state owned land under the highway and MBTA ramps. These easements differ by parcel, but basically are for laying and maintaining utility lines and for providing pedestrian and service vehicle access to the park.

Present access for both pedestrians and vehicles is at the western corner of the park, on a roadway which passes under the existing inbound Airport ramps and runs along the edge of the park. According to the 1954 deed to the parkland, the Boston Parks and Recreation Department easement over this roadway is for pedestrians and service vehicles only, although this restriction is not enforced. The 1954 deed provides an easement for public vehicular access from Porter Street to the parcel southwest of the inbound Airport Road and a pedestrian easement between this parcel and the main field. Improvement of this connection to Porter Street is proposed as a part of the project to offset negative impacts which will occur because of the project (see Figure 77.)

Although the facilities themselves do not possess any unusual characteristics, the fact that this park is a replacement for parkland previously taken for Airport expansion makes any encroachment on this park of major concern to the community.

<u>Location and Amount of Land to be Used</u>

No surface parkland is permanently used by the Preferred Alternative. Approximately 34,000 square feet (or 4.4 percent of the total recreation area) of land along the southeastern end of the park will be disrupted temporarily during construction of the underground ramp connecting the outbound Airport Road to the Third Harbor Tunnel, and a subsurface easement will be permanently occupied by this ramp. A construction easement will include a 40 foot wide strip inside the edge of the tennis courts. These courts are not actively used at present, perhaps due to lack of maintenance. This cut and cover construction will last for about three months, after which time the surface of the land will be restored to its original condition. The tunnel will permanently occupy a subsurface easement approximately 50 feet wide and 200 feet long (1,000 square feet).

Also, a temporary detour of the inbound Airport Road along the southwestern edge of the park will require the use of a 10-foot wide strip of the park occupying approximately 6000 square feet of parkland (0.8% of the park area). This temporary taking will last for approximately two years, after which time the land will be restored to its original condition. No recreational facilities will be affected by this temporary service road; pedestrian and vehicular access to the park will remain unchanged.

<u>Other Impacts</u>

Air quality at East Boston Memorial Stadium will be substantially improved by the Preferred Alternative, compared to No-Build conditions in 2010 (see Section 4.7 <u>AIR QUALITY IMPACTS</u>). With the noise barrier proposed as part of this project, overall noise levels at the park will be decreased by the project relative to existing and year 2010 No-Build

nditions (see Section 4.8 NOISE AND BRATION IMPACTS).

deral Agency Funding of Improvements

Conversion of parkland which been improved or acquired with deral funds to non-park use requires proval by the funding agency; in me cases this approval is contingent on replacement of the affected rkland. The city has recently been warded an Urban Parks and Recreation covery Grant (UPARR) for recreation improvements at East Boston emorial Stadium. Because the eferred Alternative requires only emporary use of parklands, eplacement of affected parkland is ot required. The National Park ervice is prepared to authorize a onstruction permit for East Boston emorial Stadium at the time the ommonwealth of Massachusetts ompletes the Final Environmental mpact Statement/Report and Final ection 4(f) Evaluation (see 7 ovember 1983 letter in COMMENTS AND OORDINATION). According to the U.S. epartment of the Interior and the tate Liaison Officer, no Land and ater Conservation Fund Act funds have een used on this property, so the ark is not subject to Section 6(f) replacement requirements. (See etters from U.S. Department of the nterior dated August 29, 1983, and rom the State Liaison Officer dated ugust 23, 1983 in COMMENTS AND ORDINATION.)

lternatives Which Would Avoid the ection 4(f) Property

Although no surface parkland is rmanently used by the Preferred lernative, as described in the evious subsection Location and ount of Land to be Used, temporary nstruction and subsurface easements e required. All of the build ternatives which include a four-lane rd Harbor Tunnel examined in the IS/DEIR and SDEIS/SDEIR require the e of substantially more parkland an does the Preferred Alternative. ternatives which would avoid mporary and subsurface easements as well as permanent surface use of the Section 4(f) property are as follows: (a) Alternative 6 and the No-Build Alternative, and (b) the Two-Lane Tunnel Concept.

(a) Alternatives which did not include a Third Harbor Tunnel (Alternative 6 and the No-Build Alternative) were examined in the DEIS/DEIR and SDEIS/SDEIR; these alternatives did not satisfy the basic project objective of improving Central Artery and cross-harbor traffic flow, and were not selected.

(b) The Two-Lane Tunnel Concept would avoid both temporary and permanent use of the East Boston Memorial Stadium but would not provide transportation improvements comparable to the Preferred Alternative, because the Two-Lane Tunnel Concept does not include a direct connection to Route 1A North. Without this connection, all northbound traffic with destinations beyond Logan Airport would have to continue to use the existing tunnels, or else exit from the new cross-harbor tunnel and use the Airport roadway system to reach Route 1A North, increasing travel time and adding to the congestion at Logan Airport. As a consequence, this concept does not adequately address cross-harbor travel demand, and would result in congestion in the existing and proposed tunnels and on the Central Artery south of the Callahan/Sumner Tunnels. (See the separate report volume, "Two-Lane Tunnel/Optional Fort Point Channel Concepts" for a detailed analysis of the other impacts of this concept.) For these reasons, the Two-Lane Concept does not satisfy basic transportation objectives for the design year and was not selected.

Although the Preferred Alternative involves no permanent surface use of the park and will increase usable park area by 17 percent, temporary impacts remain which will affect approximately 5 percent of the park's area (tennis courts for three months and a narrow strip along the park's edge for two

years). Minor design modifications to the Preferred Alternative were studied in an attempt to avoid even this temporary use of the Section 4(f) property.

Complete avoidance of the temporary Section 4(f) impacts would require the underground ramp affecting the park's tennis courts (as shown in Figure 77) to be realigned to the southeast, which would have adverse impacts on the foundations of the 12-story wing of the Airport Hilton Hotel (located just east of the proposed Cross Road and south of the Airport egress road); the feasibility and cost of underpinning the hotel cannot be determined without more detailed engineering design studies .

Complete avoidance of the Section 4(f) property would also require realignment of the inbound Airport Road to the southwest, both to avoid the temporary construction easement at the edge of the park and to provide necessary vertical clearances above the relocated underground ramp. Relocation of the inbound Airport Road would introduce a reverse curve. This geometry is less desirable than the alignment of the Preferred Alternative, particularly because of the heavy traffic volumes on this roadway segment, the weaving movements which would occur on this reverse curve, and the need for clear informational signing at this location for directing motorists to various airline terminals. Meeting minimum geometric design standards for the relocated inbound Airport Road and its associated ramps would require the taking of the Hertz Check-in Center and the Eastern Airlines Fuel Farm as well as leasable airport land totalling between 100,000 and 200,000 square feet and currently occupied by Hertz, the Avis Car Rental Service Center, National Car Rental, and Eastern Airlines. This less desirable alignment is not warranted to avoid a three-month period of disruption to the park's tennis courts and a two-year disruption of a 10-foot wide strip of parkland not affecting any recreation facility within the park.

Measures to Minimize Impacts

After construction of the tunnel and Airport service road, the tennis courts will be replaced and approximately three acres of land will be added to the eastern end of the stadium grounds. This land represents a 17 percent increase in the size of the recreation area. This land will be inside the newly reconfigured Airport roadways.

Improvements to the park's entrance system from Porter Street into the stadium area will also be provided. This easement, currently existing, has not been fully operational in spite of its existence at the time of the various land transfers which created the park area in 1954. Standard measures to control construction period impacts, such as dust, construction noise, etc., will be implemented.

A noise barrier approximately 15 feet high and 2,300 feet long will be constructed around the southeastern end of the park, outside the park limits. This barrier will be a combination of earth berm and wall. The barrier, along with landscaping improvements, will buffer both visual impacts and noise impacts of the surrounding roadways.

Conclusion

Based upon the above considerations, a determination has been made that there is no feasible and prudent alternative to the use of land from the East Boston Memorial Stadium and that the proposed action includes all possible planning to minimize harm to the East Boston Memorial Stadium resulting from such use.

5.1.2 Proposed Bird Island Flats Park

This proposed park which is to be built along the edge of Jeffries Cove was discussed in the DEIS/DEIR but will not be affected by the Preferred Alternative. The alignment of the Preferred Alternative passes to

e ast of this proposed park and voves no use of Section 4(f) opety (see Figure 78).

1. Charles River Basin Reservation

scription

The Metropolitan District mmission (MDC) owns this 17,000-acre servation along, and including, the aries River, extending from the Old aries River Dam in Boston to tetown. Chapter 524 of the Acts of 09 gives the MDC authority over ructures on, across, over, or in the aries River Basin. The MDC was trized by Chapter 550 of the Acts 62 to acquire land downstream etwen the old dam and the new dam scibed in Section 5.1.4 below; ower, acquisition of property eteen the dams has not occurred. e playground extending from Leverett rle to Cambridge Street and the nfellow Bridge along the Boston id of the Charles River will be ffcted by the project, as will everett Circle (see Figure 79).

Facilities in the landscaped laground area include a pedestrian nd bicycle path, two tennis courts, a wiming pool, a wading pool, a asball field, a tot lot and a ocer/football field. Pedestrian cess to this part of the reservation s rom the pedestrian overpasses at evrett Circle, Blossom Street, and abridge Street.

The park is heavily used by eidents of the metropolitan area.

oation and Amount of Land to be Used

A strip of land up to 10 feet e and approximately 50 feet long ss than 500 square feet in area), ng the intersection of the Msgr. rien Highway and Storrow Drive, l be permanently used for the onfiguration of Leverett Circle. s strip is part of an MDC Police tion parking lot. A temporary nstruction easement which includes existing roadway west of Leverett rcle and a 10-foot width along the roadway will be needed for a distance of approximately 500 feet, temporarily involving 5,000 square feet of parkland. This land will be used for approximately one year, while the Storrow Drive/Central Artery connections are constructed. The affected area includes the pedestrian overpass at Leverett Circle, a narrow strip of land at the edge of the MDC police parking lot and the edge of the tot lot. The pedestrian overpass will be reinforced during construction, but will remain serviceable in its present location. At the end of construction in this area, the land will be returned to its original condition.

A new tunnel ramp from the Central Artery to Storrow Drive will be built through Leverett Circle, requiring temporary disruption of the Circle during construction. The interior of the existing traffic circle is presently a grass-covered area of approximately 32,000 square feet, and contains a bridge pier and entrances to the MBTA Green Line Science Park Station, which passes over the Circle; the portion of this area which is disturbed during construction will be restored following construction.

The relocation of Nashua Street to improve the geometry of the traffic circle will require the permanent use of an area within the Reservation approximately 30 feet wide and 100 feet long (3,000 square feet); this area is currently used by the Massachusetts Department of Public Works for surface parking, and is not presently available for park use. A 20-foot-wide construction easement will also be needed next to relocated Nashua Street in the parking lot.

An additional ramp connection required to maintain access to Msgr. O'Brien Highway joins Nashua Street outside the park boundary and does not involve Section 4(f) land.

Other Impacts

During the construction period, there will be increased traffic

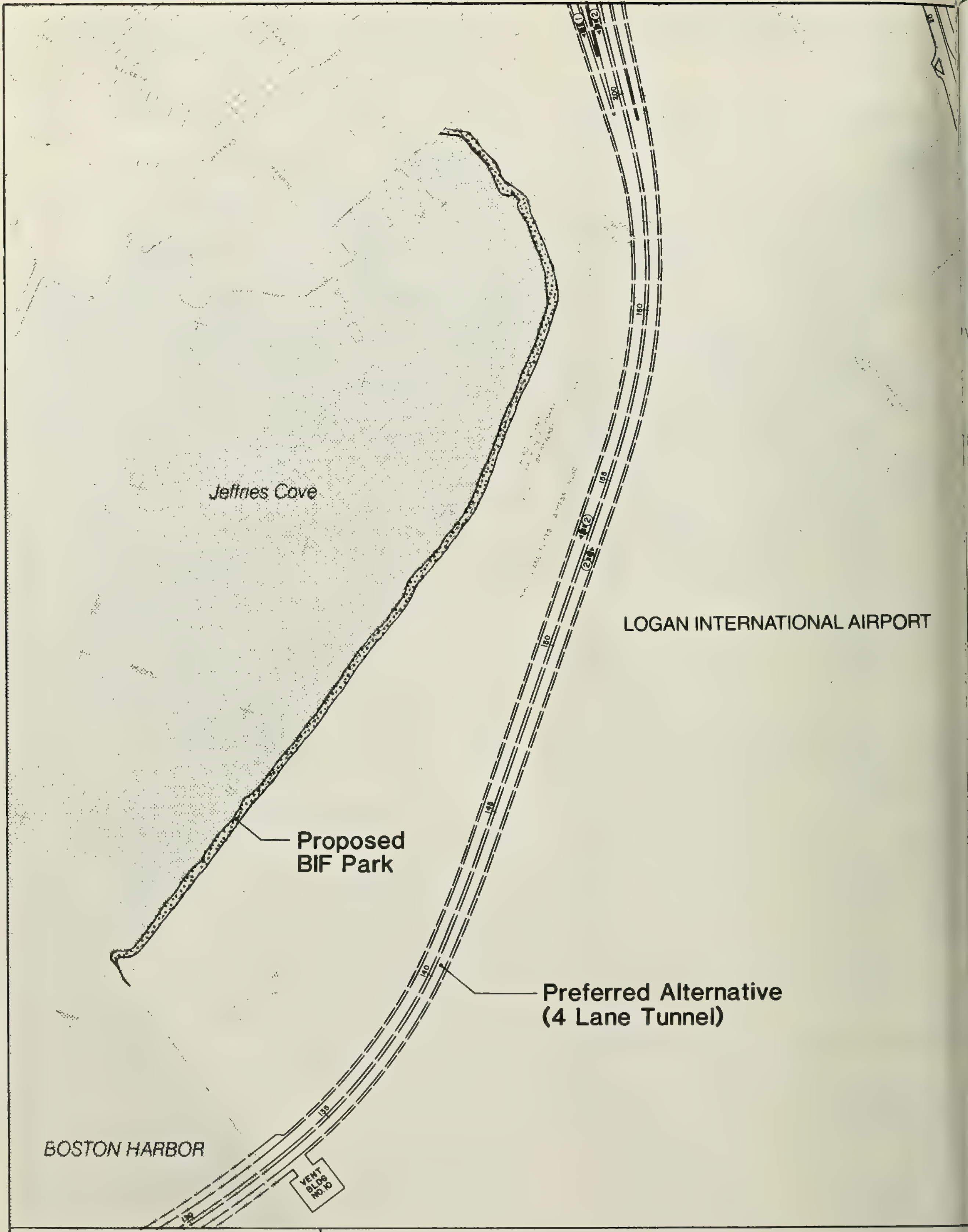
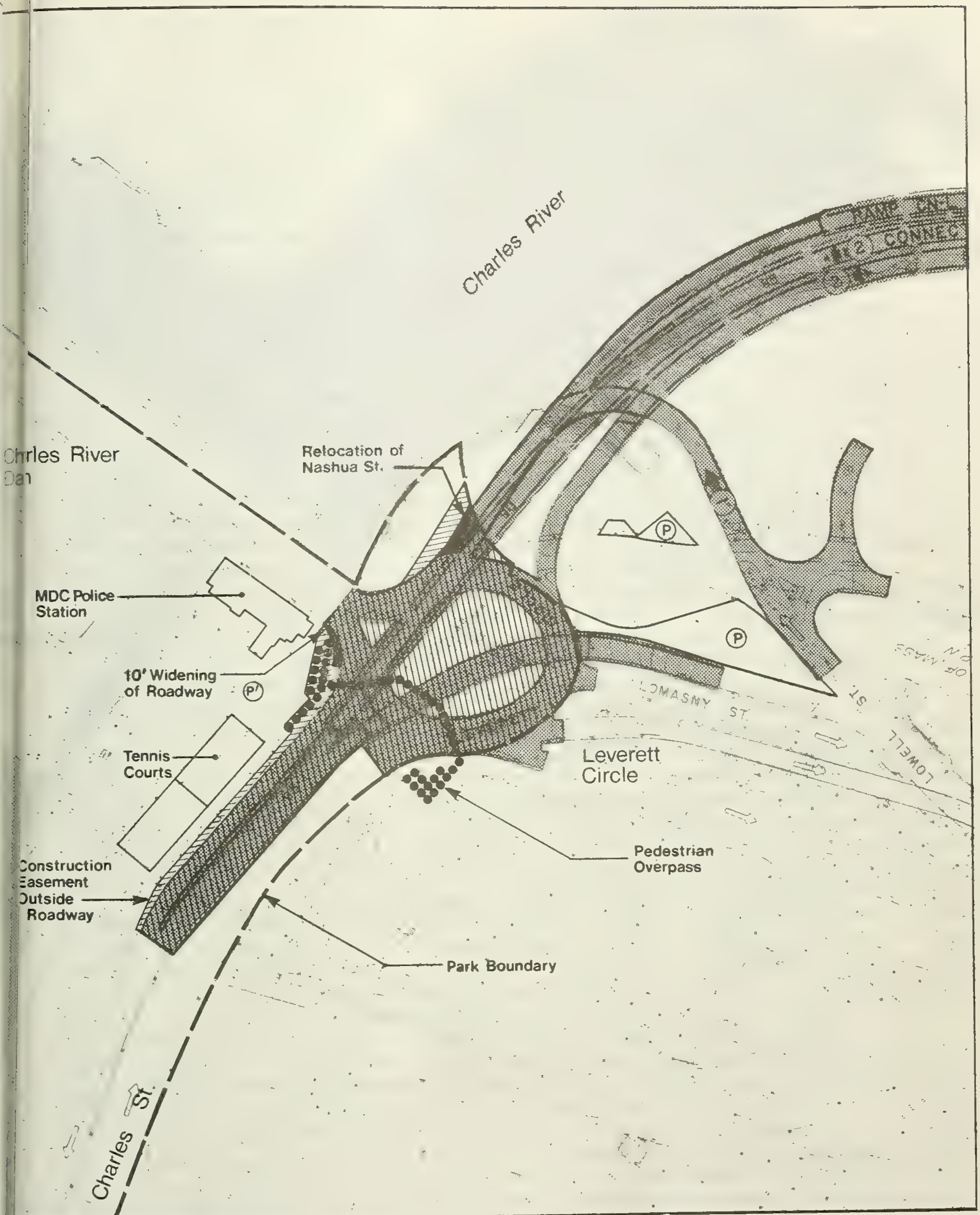


Figure 78

Location of Proposed Bird Island Flats Park in Relation to the Preferred Alternative

0 100 200 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery



- Park Boundary
- Construction Easement
- Tunnel or New Roadway
- (P) MDC Land Used for MDPW Parking
- (P') MDC Police Station Parking

Figure 79
Charles River Basin — Impacts

0 50 100 200 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

congestion on the portion of Storrow Drive abutting the playground, and consequent increases in air pollution in and around the playground near Leverett Circle. After construction, Leverett Circle will have decreased traffic, reducing the traffic-related air and noise pollution in and around the playground.

Federal Agency Funding of Improvements

Although Land and Water Conservation Fund (LWCF) funds were expended for tennis courts in the reservation, this part of the park will not be disrupted by the Preferred Alternative. Therefore, there is no conversion of Section 6(f) properties (see letters from EOEA and the National Park Service dated 5 April 1984 and 12 April 1984, respectively, in COMMENTS AND COORDINATION).

Alternatives Which Would Avoid the Section 4(f) Property

The existing connection of the Central Artery to Storrow Drive at Leverett Circle, within the Reservation, is a necessary link in the regional transportation system at present and will continue to be a necessary link following completion of the project. Two types of alternatives to the Preferred Alternative were examined: (a) those which make the connection with Storrow Drive at another location; and (b) those which do not involve construction to modify the existing connection.

(a) The Preferred Alternative, while not avoiding the Section 4(f) property entirely, makes the connection with Storrow Drive in the location which involves the least impact to the Reservation. Storrow Drive lies entirely within the Reservation at its eastern edge and Leverett Circle at its northeastern corner, which is closest to the Central Artery; recreational and park facilities lie beyond these roadways. Consequently any alternative connection to Storrow Drive would lie further into the Reservation and would involve larger amounts of Section 4(f) land and impacts to more recreational facilities.

(b) The No-Build Alternative, and other alternatives which included no Central Artery improvements were examined in the DEIS/DEIR and SDEIS/SDEIR; these alternatives involve no construction in the Reservation and would avoid Section 4(f) property but do not satisfy the basic transportation objective of improving traffic flow on the Central Artery and were rejected for this reason.

Design modifications to the Preferred Alternative which would involve no change in the present Central Artery connection to Storrow Drive at Leverett Circle were examined. These modifications would retain the existing two-lane underpass at the Circle by connecting all northbound and southbound Central Artery traffic to the existing ramp approach to Storrow Drive and eliminate the Preferred Alternative's minor modifications in surface road geometry at the Circle.

Careful examination of this alternative reveals that it may be possible to utilize the existing two-lane tunnel segment under the Leverett Circle. However, it is clear that even with this possible modification there will still remain some construction period use of Leverett Circle, particularly at those locations where new ramps to local street connections will have to tie into the existing geometry of Leverett Circle. Use of a two-lane tunnel in this segment would have negative traffic capacity characteristics compared with the three-lane tunnel incorporated with the Preferred Alternative. Further design work may show that the two-lane tunnel segment is the appropriate solution.

Some Charles River Basin Reservation land will be used during the construction phase in either event, and is therefore covered under this Section 4(f) Evaluation.

...asures to Minimize Impacts

Standard measures to control ...nstruction period impacts, such as ...st construction noise, etc., will ...plemented. The temporarily used ...-foot strip of land along the edge ... the park and the grassy area inside ...everett Circle will be restored to ...heir original condition following ...nstruction.

...onclusion

Based upon the above ...nsiderations, it is determined that ...here is no feasible and prudent ...lternative to the use of land from ...he Charles River Basin Reservation ...nd that the proposed action includes ...ll possible planning to minimize harm ...o the Charles River Basin Reservation ...esulting from such use.

...1 Paul Revere Landing Park

...escription

The MDC owns this 8.5-acre park ...round the New Charles River Dam at ...he head of the Charles River Basin in ...oston. The park is part of the ...7,00-acre Charles River Basin ...eservation, but not contiguous to its ...ther land. Paul Revere Landing Park ...xtends from Boston's North Station ...rea across the dam and into the ...harlestown neighborhood. It consists ...f landscaped parking and pedestrian ...rea near North Station, the dam, and ... park area in Charlestown (see Figure ...0).

A landscaped pedestrian way ...ordering the parking area has two ...branches, one which runs a short ...distance along the Boston edge of the ...harles River, while the other ...continues across the locks of the new ...dam and the pumping station and ends ...on the Charlestown side of the park. ...The parking area accommodates ...approximately 100 cars. The existing ...High-Level Bridge connecting the ...Central Artery with Interstate Route ...93 crosses over part of the parking ...area and the locks at an elevation of ...approximately 40 feet to 50 feet to bottom of structure, depending on location.

Although the MDC has conceptual plans to acquire and develop more land along both banks of the Charles River to create a greenbelt strip, of which Paul Revere Landing Park would be part, this land has not yet been acquired by the MDC, and it is not subject to Section 4(f) regulations. However, actions to aid planned property acquisition for this greenbelt are included among the mitigating measures described below.

Pedestrian access to the park on the Charlestown side is by a stairway from the existing North Washington Street Bridge; from under this bridge; and from under the existing High-Level Bridge. On the North Station side of the river, pedestrian access is from Beverly Street, under the existing Central Artery viaduct. The pedestrian way is heavily used by area residents walking between Charlestown and downtown Boston.

Location and Amount of Land to be Used

The Charlestown side of the Paul Revere Landing Park is affected both by the Preferred Alternative of the present project and by the separate Central Artery North Area Project. The North Area Project involves reconstruction of the Interstate Route 93 viaduct and its approaches to Route 1. The preliminary design for the North Area Project involves surface street modifications that require the redesign of the Charlestown side of Paul Revere Landing Park into a larger, but reconfigured parcel.

The preliminary design for the North Area Project will have to be modified as a result of the Central Artery Depression Project; design coordination between the two projects involves the transition from the new Charles River bridges constructed in the Central Artery Depression Project to the new Interstate Route 93 viaduct constructed in the North Area

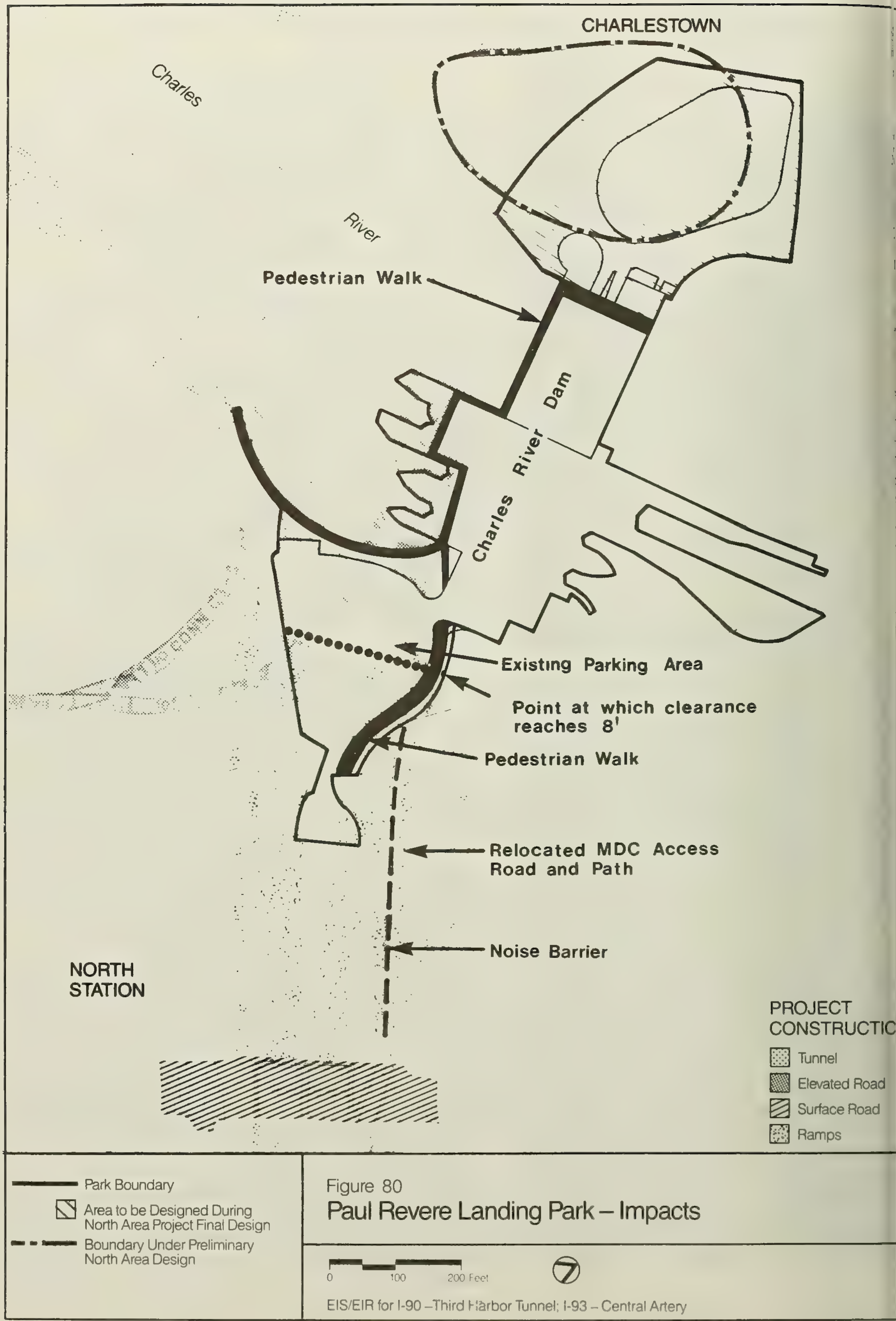


Figure 80
Paul Revere Landing Park – Impacts

...t. This transition occurs in ...vicinity of the Paul Revere ...g Park.

Construction activities (due to ...ntral Artery depression) on the ...stown side of the Charles River ... MDPW-owned land to the west of ...rk, part of which has previously ...ledged to become replacement ... and following construction of ...rth Area Project (see Figure ...). The net effect of both projects ...s part of the park will be to ...ase its area; the final ...guration of the park will be ...mined following design ...ination between the projects and ...ltation with the MDC. Impacts on ...harlestown side of the park are ... detailed in the Section 4(f) ...ation for the Central Artery ... Area Project, which will be ...ized during final design of the ... Area Project, beginning in 1984.

The new MDC Charles River Dam ...ts parking area on the Boston ... of the Charles River lie south of ...harlestown area just described. ...existing High-Level Bridge will be ...aced by two lower-level bridges ...ecting the depressed Central ...ry to the Interstate Route 93 ...uct and its approaches to the ...ic-Tobin Bridge in Charlestown. ...new connections will be ...tructed as open cut sections with ...-foot walls, rising to ramps on ...ined fill, and then to low-level ...ges 8 to 30 feet above the land ... or water. The land extending from ... beginning of the open cut sections ...he point at which the clearance ...r the bridges reaches eight feet ... no longer be available for ...ing or pedestrian use which occurs ...present. The area to be taken is ...roximately 40,000 square feet. At ... water's edge, there will be a ...foot vertical clearance between the ...tom of the bridges and the ...estrian path along the river's ...e, which presently terminates at ... western property line of the MDC ...d (see Figure 80).

Within the 40,000 square foot area just described, construction of the open cut sections and lower-level bridges also will result in the permanent taking and replacement in a new alignment of the existing park access road and the pedestrian walk leading to the dam. The Preferred Alternative also includes construction of subsurface ramps between the Central Artery and Storrow Drive which will require realignment of the existing Charles River bulkhead and the existing path along the river edge.

<u>Other Impacts</u>

A Leverett Circle ramp to Interstate Route 93 northbound will cross above the parking area (at a measured height of approximately 40 feet from bottom of structure); this ramp will cross over approximately 14,400 square feet of parkland. Cars and pedestrians will be able to move freely under this ramp.

The two new bridges across the Charles River will be approximately 23 feet above mean high water at the dam's recreational boat locks and 30 feet above mean high water at the large commercial boat lock; this is lower than the existing High-Level Bridge, which is approximately 40 and 50 feet above mean high water at these respective locks. Navigation will not be affected by the new bridges. The northbound bridge will be 60 to 100 feet closer to the locks and pedestrian walkway over the pumping station than the existing High-Level Bridge. It will occupy approximately 1,600 square feet of air rights over the corner of the park on the Charlestown side of the river, and 29,400 square feet of air rights over the dam and property on the Boston side of the river, casting shadows on the dam. (The current High-Level Bridge casts shadows further upstream.) Additionally, each new bridge structure, as currently designed, will be 58 feet from the underside of bridge to the top of truss, contributing to their visual impact. The shadow effect, and the closer proximity of the pedestrian walkway to traffic on the northbound

bridge, will reduce the aesthetic quality of the walk and its public recreational value. Northbound traffic on the ramps to the new bridges across the Charles River will increase noise levels at the park.

The construction of a ventilation structure on the site of the Charles River Building, adjacent to the park will also have potential visual impacts in the park.

During the construction period, the MDC parking lot will be reduced to approximately one half its capacity for approximately one year.

Alternatives Which Would Avoid the Section 4(f) Property

Alternatives to the Preferred Alternative which would avoid or reduce impact on the Section 4(f) property are as follows: (a) alternatives which involve no improvements to the Central Artery, (b) modifications to the alignment of the Preferred Alternative, and (c) modifications to the profile of the Preferred Alternative.

(a) Removal of the existing bottleneck caused by the High-Level Bridge is one of the major objectives of the project. The No-Build Alternative and alternatives which do not include depressing the Central Artery and replacing the High-Level Bridge were examined in the DEIS/DEIR and SDEIS/SDEIR; these alternatives did not satisfy the basic project objective of improving Central Artery traffic flow, and were rejected.

(b) The alignment for the proposed bridges closely parallels that of the existing bridge in a corridor that is tightly constrained by the need to connect the Central Artery to the south with the Interstate Route 93 viaduct and Route 1 to the north within a distance of less than 2,000 feet; the short distance between these points makes alternative bridge alignments to the west or east of this park impossible. The existence of the Orange Line tunnel makes it impossible to shift the bridges to the west. Shifting the bridges to the east would cause greater impacts to the Charles River Dam, which is part of the Section 4(f) property, as well as to the Stop and Shop Bakery Building and other buildings in the Causeway-North Washington Streets District, which is a separate Section 4(f) area described below.

(c) The bridge profile is similarly constrained. If the Central Artery crossing of the Charles River were placed in a tunnel underneath the river, to completely avoid surface and air rights use of Section 4(f) parkland, connection to the Mystic-Tobin Bridge (Route 1) would be impossible, owing to the vertical differences between them. For the same reason, the depressed roadway's profile would not meet that of the existing Interstate Route 93 until the Sullivan Square area in Somerville, approximately 5,000 feet north of the Preferred Alternative's northern limit. In addition the Central Artery crossing could not be placed in a tunnel beneath the river without major construction impacts to the river basin, its navigation channel, and the Charles River Dam.

Higher profiles for the Charles River bridges were considered and rejected because they would not avoid the Section 4(f) property. Although higher bridge profiles would reduce some of the visual impacts to the Section 4(f) property, this modification would cause other impacts, including impacts to Section 4(f) historic districts, disproportionate to their benefit to the Paul Revere Landing Park. Higher bridges would require relocation of Causeway Street and the removal of the existing Central Artery structure prior to the construction of the new bridges; maintaining continuous operation of the Central Artery during construction would therefore not be possible.

Mitigating Measures

A new MDC access road with a

k for pedestrians will be built st of the existing access d. A reconfigured bulkhead will built far enough into the o accommodate a new riverfront ian walk. The parking lot will nfigured to accommodate 100 , the number in the existing Replacement facilties will be aped to mitigate visual impacts project.

Final design of the two bridges esult in more attractive ures, reducing shadows on the rian walk. Design solutions include the use of a cable sion design to lighten the superstructure or improvements underside of the bridge ure such as lighting. The bility of bridge design natives will be studied during design phases. Work on the design will involve consultation en the MDPW, MDC, FHWA, the U.S. Corps of Engineers, and the U.S. and Wildlife Service.

The ventilation building ent to the park will receive tectural and landscape treatment nimize visual impacts on the park.

A noise barrier constructed the western edge of the park s road and pedestrian walk will de a noise and visual buffer en this road and the adjacent al Artery northbound on-ramp.

As discussed above in the cription of the Section 4(f) erty, the MDC has plans to acquire rfront property to create a nbelt connecting Paul Revere ing Park with the Charles River rvation further upstream. EOTC MDPW will continue to work closely the MDC to seek to facilitate land acquisitions as a measure to et visual and other impacts of the erred Alternative on Paul Revere ing Park. Suitable remnants of els acquired for right-of-way for project or the related North Area ject will be made available to the for park use.

Conclusion

Based upon the above considerations, it is determined that there is no feasible and prudent alternative to the use of land from the Paul Revere Landing Park and that the proposed action includes all possible planning to minimize harm to the Paul Revere Landing Park resulting from such use.

5.2 HISTORIC RESOURCES

Of the historic resources discussed previously in Sections 3.11 and 4.14, which are either listed on or eligible for the National Register of Historic Places or potentially eligible for the Register, the resources listed below are directly affected by the Preferred Alternative. For a more detailed discussion of these and other resources in the project area, see Section 3.11.1 Historic Resources; for a discussion of indirectly affected historic resources, and the Section 106 review process, see Section 4.14.2 Effects on Historic Properties.

Determination of adverse effects on historic properties has been made in conformance with the Preliminary Case Report prepared pursuant to Section 106 of the National Historic Preservation Act, and mitigating measures described below are consistent with the Section 106 Memorandum of Agreement (MOA).

5.2.1 Charles River Basin District

Description

This National Register District is owned by the Metropolitan District Commission; it occupies much of the Charles River Reservation and includes the river, its banks, bridges, and park land from the old Charles River Dam in the project area to the Eliot Bridge, six miles upstream, along with Storrow Drive and Leverett Circle. Among its contributing features are the MDC police headquarters at the Boston side of the old dam, and the MBTA's concrete arch viaduct to

Cambridge.

For a detailed analysis of long-term and construction impacts, mitigating measures, and alternatives which would avoid the Charles River Basin District, see Section 5.1.3 and Figure 79 of this Section 4(f) Evaluation. The character of the area will not be changed by the project after completion of construction, and the FHWA and the State Historic Preservation Officer have concurred in a finding of no effect on this District (see 7 September 1983 letter in COMMENTS AND COORDINATION).

Conclusion

Based upon the above considerations, it is determined that there is no feasible and prudent alternative to the use of land from the Charles River Basin District and that the proposed action includes all possible planning to minimize harm to the Charles River Basin District resulting from such use.

5.2.2 Causeway-North Washington Streets District

Description

This potential historic district comprises late nineteenth and early twentieth-century five- to seven-story brick buildings with notable brick, stone, and metal detailing; they were constructed for a variety of mercantile and manufacturing purposes. The Charles River Building (1907 and 1909) at 131 Beverly Street is similar in size, materials and detailing to the attached Hoffman Building and the adjacent Stop and Shop Bakery. None of these buildings is individually eligible for the National Register. The District includes the eastern half of the original Bulfinch Triangle, which is divided by the elevated Central Artery and MBTA Green Line structures.

Location and Amount of Land to be Used

The alignment of the Preferred Alternative requires the taking of the Charles River Building and the loading dock at the west end of the Stop and Shop Bakery Building for construction of a connecting ramp from the depressed Central Artery northbound to Storrow Drive. The tight corridor and required horizontal geometry of the ramp necessitates this alignment (see Figure 81). Because of its position in relation to the Stop and Shop Bakery Building and the Hoffman Building, and the limited number of buildings in the area, removal of the Charles River Building will further permanently alter the historic fabric and character of an area which has already been negatively affected by construction of the existing Central Artery viaduct. Approximately 0.9 acres of the total 6.7 acre district will be affected.

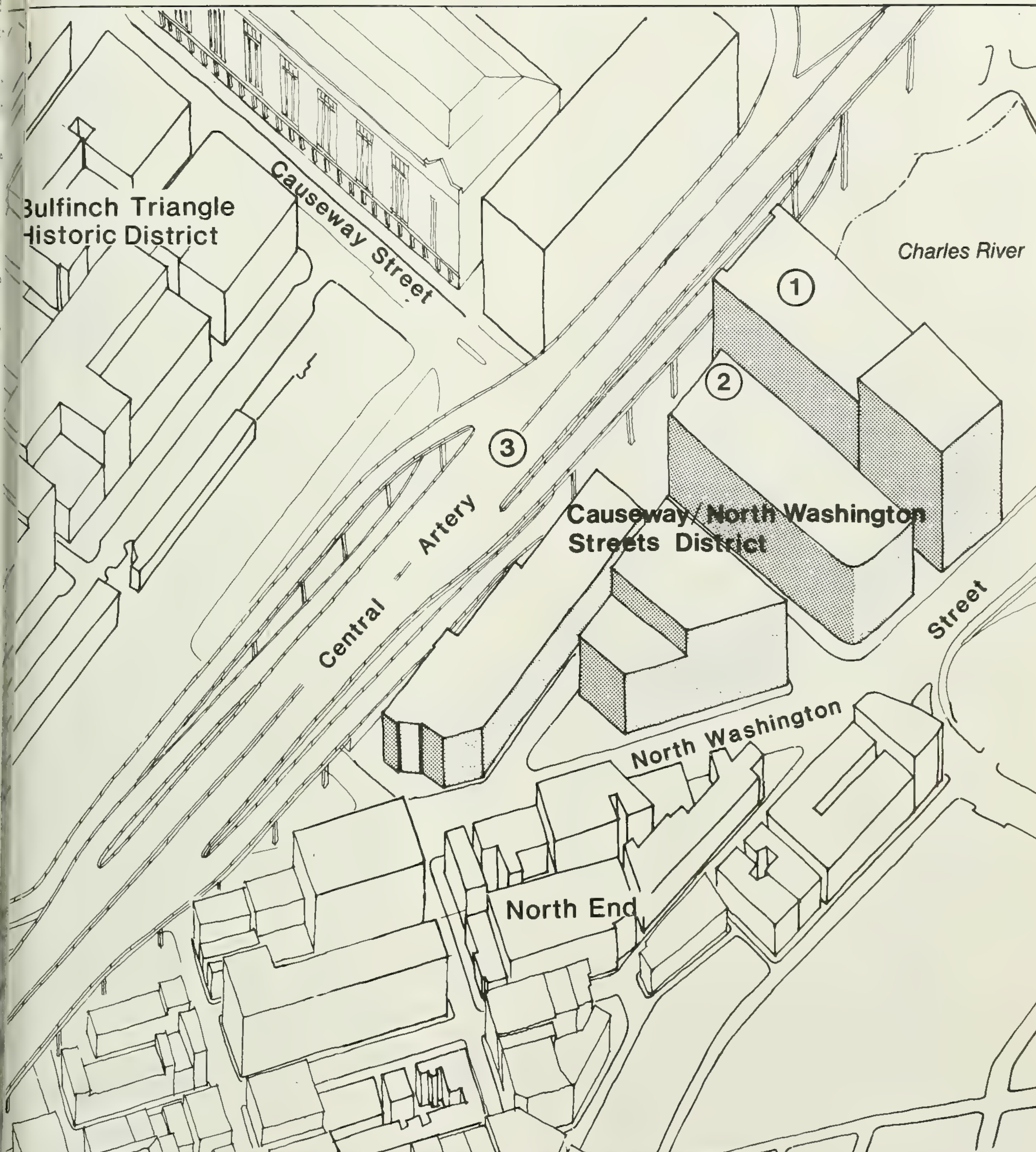
Other Impacts

These alternatives will also have the positive impact of removing the Central Artery viaduct from the historic Bulfinch Triangle area and partially reuniting the Causeway-North Washington Streets District with the Bulfinch Triangle to the west, a potentially eligible National Register District.

A 10-story ventilation building measuring approximately 60 feet by 80 feet will be built on the former site of the Charles River Building. This new building will not be out of character with the surrounding industrial area.

Other long-term indirect impacts consist of increased traffic through the area via existing streets and the proposed Surface Artery and Central Artery ramps, which will partially isolate the District, thereby reducing its economic viability and increasing the potential for loss of its other historic buildings.

The construction-period impacts consist of traffic congestion, vibration, and construction disruption.



Charles River Building to be taken (future site of ten story, 60′ x 80′ Ventilation Building)

Stop & Shop Bakery loading dock* to be modified

Central Artery viaduct to be removed, partially reuniting district with Bulfinch Triangle

*Not Visible in Drawing

Figure 81

Impacts on the Causeway/North Washington Streets Historic District

0 50 100 200 Feet

Alternatives Which Would Avoid the Potential Section 4(f) Property

Alternatives which would avoid or reduce use of the potential Section 4(f) property are as follows: (a) the No-Build Alternative and other alternatives which do not improve the Central Artery; (b) modifications to the Preferred Alternative's alignment; and (c) underpinning of the Charles River building and relocation of the proposed ventilation structure.

(a) Improved traffic flow between the Central Artery and Storrow Drive, Interstate Route 93 in Charlestown, and the Mystic-Tobin Bridge is a primary objective of the project. Alternatives which did not include depressing the Central Artery and replacing the High-Level Bridge were also examined. Because these alternatives did not satisfy the stated transportation objective of improved traffic flow on the Central Artery and between the Central Artery and Interstate Route 93, the Mystic-Tobin Bridge, and Storrow Drive, they were rejected from further consideration.

(b) Design modifications to the Central Artery to Storrow Drive ramp alignment were examined; these modifications involved either relocating the ramp to the south of the District or relocating it to the north of the District.

There are several constraints that affect realignment of the ramp to the south. Realignment in this direction must be to North Washington Street on the opposite side of the district from the Preferred Alternative (alignments between North Washington Street and the Preferred Alternative go through the middle of the District and increase the amount of Section 4(f) property affected). Realignment to beneath North Washington Street requires that the ramp diverge from the northbound Central Artery just north of the Sumner Tunnel connection with the Artery. This realignment of the Storrow Drive exit ramp would overlap with the northbound entrance ramp from the Sumner Tunnel, making it impossible for traffic from the Sumner Tunnel to reach Storrow Drive. In addition, relocation of the Storrow Drive ramp to the south of the Section 4(f) District would involve a circuitous alignment passing to the east of the District and across the Charles River to avoid the Orange Line Tunnel, the foundations of both the North Washington Street Bridge and the New Charles River Dam, the Paul Revere Landing Park, and the complex system of ramps in the North Area Project before turning back to cross the river a second time and connect with Storrow Drive.

The alternative of relocating the ramp to the north of the Section 4(f) District involves similar conflicts with the new Central Artery bridge foundations, the Charles River Dam, Paul Revere Landing Park, and/or the ramp system in the North Area Project.

A further ramp alignment alternative would utilize a sharper turning radius to accomplish the left-turn movement (from Artery northbound to Storrow Drive westbound with reduced land taking impact to the east. Specifically, design refinement studies suggest that the loading dock of the Stop & Shop Bakery Building would still be taken, while the Charles River Building would not need to be taken or underpinned. In this design alternative, land included in the potential historic district (ie, the loading dock of the Bakery Building) would still be used, but the overall net impact would be significantly less. However, because of this expected "use" of the land included within the potential historic district, the procedures of Section 4(f) would continue to be applicable to this alternative.

In summary, the alternatives of relocating the Storrow Drive ramp connection either to the north or south of the Causeway-North Washington Streets District were rejected because of conflicts with major traffic

mc ements and/or conflicts with s eral major structures which must be c ssed by such alignments.

(c) The possibility of r aining the current alignment and u erpinning the Charles River B lding, rather than taking it, was a o examined. This alternative was r jected for several reasons: the c t of underpinning the building w ld be approximately $5 million; p tions of the building would have to b vacated during the complicated and l ngthy underpinning operations; and c nstruction of the depressed Central A tery and the MDC Access Road would s ill require taking the access and l ading area for the building, n cessitating changes in the use of t e building, and possibly harming the e onomic feasibility of maintaining t e building. The location of the p oposed ventilation building would a so have to be revised because it is p esently proposed for the Charles R ver Building site. The MBTA's O ange Line Tunnel prohibits c nstructing the ventilation building w est of the Central Artery. As i ndicated in Section 4.7.5, violations o f the Commonwealth's policy level for NO_2 emissions from the proposed v entilation buildings require a dditional detailed air quality m odeling and analysis to mitigate this i mpact. The final location of this b uilding will be determined in a ccordance with these analyses, and a lso in conformance with the Section 1 06 Memorandum of Agreement. It s hould be noted, however, that a d ifferent site would also lie either w ithin this District, possibly r equiring taking another building, or i n the Charles River.

Mitigating Measures

Further design activity should focus on actions which allow the Charles River Building to remain. Design refinements as noted above suggest that modifications to the radius of curvature of the ramp from the Central Artery northbound to Storrow Drive westbound may obviate the need for the taking of the Charles River Building. The Stop and Shop Bakery Building loading facilities will be modified either to allow continued operations or to serve an alternative building use with lesser loading requirements, such as office or lighter industrial uses, which occupy the adjacent Hoffman Building. (Stop and Shop has announced that the bakery will be relocated, independent of this project. The building will be available for a number of other possible uses which require less extensive loading facilities.) Historic documentation of these two buildings will be done as approved by the Historic American Building Survey/Historic American Engineering Record (HABS/HAER) prior to alteration or dislocation (see the Section 106 Memorandum of Agreement in COMMENTS AND COORDINATION).

Construction staging and traffic management measures will be used to reduce impacts during construction. Vibration impacts within the District will be mitigated through measures such as water jetting, pre-trenching, and pre-augering of piles and maximum use of slurry wall construction, as described in Section 4.8.2 Vibration Impacts, and through appropriate design of construction staging and contract specifications to avoid structural damage, as provided in the Section 106 Memorandum of Agreement.

Design guidelines for the development of the ventilation structure will be developed by the MDPW, in consultation with the Massachusetts SHPO and BLC, as provided in the Section 106 Memorandum of Agreement.

Conclusion

Based upon the above considerations, it is determined that there is no feasible and prudent alternative to the use of land from the Causeway-North Washington Streets District and that the proposed action includes all possible planning to

minimize harm to the Causeway-North Washington Streets District resulting from such use.

5.2.3 Fort Point Channel District

Description

Fort Point Channel, a potentially eligible National Register District, is fully described in Section 3.11.1 of this report. It includes the Channel waterway and bulkhead, four significant bridges, and the subarea of brick warehouses in South Boston developed (1880-1930) by the Boston Wharf Company.

Location and Amount of Land to be Used and Other Impacts

Changes to the physical configuration of the Channel as a result of the Preferred Alternative will include introduction of a partially visible tunnel box, removal of part of the historic bulkhead, removal of the Old Colony Railroad Bridge and the temporary alteration of the Summer Street Bridge, and associated visual impacts due to the introduction of a surface roadway and ventilation building (see Figure 82). Approximately 10.3 acres (or 9.5 percent) of the Fort Point Channel area will be affected.

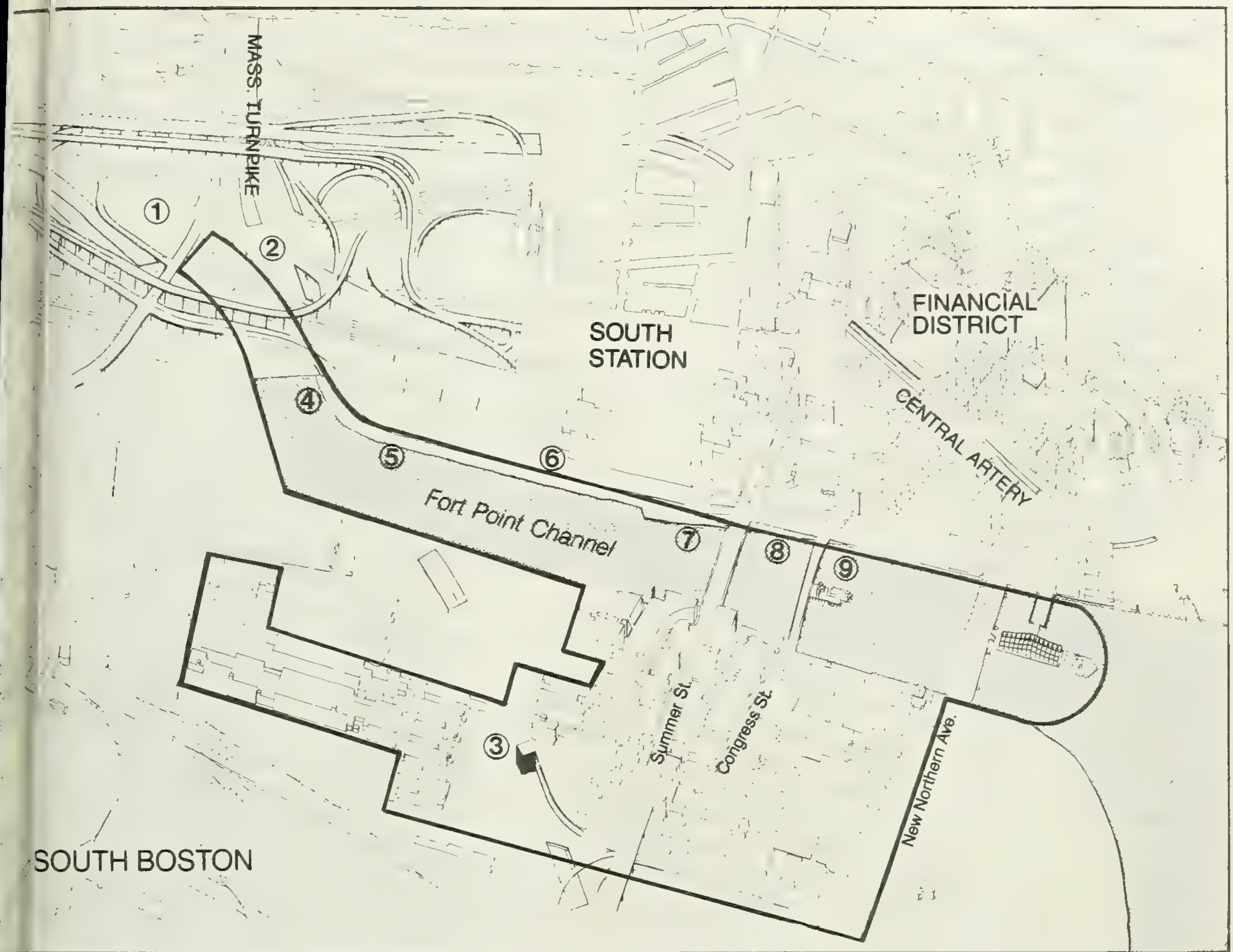
The southern end of the Channel will be filled to a new bulkhead line located near the existing Dorchester Avenue Bridge (south of the Gillette property in South Boston). The historic bulkhead line on the Boston side of the Fort Point Channel will be altered by construction of a two-lane, northbound new Dorchester Avenue which will extend approximately 30 feet inside the Channel, from the Dorchester Avenue Bridge to a point approximately 400 feet south of the Summer Street Bridge. The road will be built on slurry walls with four-foot square knock-out panels to allow water to pass through, with a false bulkhead of granite and a 10-foot adjacent pedestrian walk. In the 400 feet south of Summer Street, a deck, slightly lower than new Dorchester Avenue, will be constructed on top of the tunnel box. The deck plus Dorchester Avenue will project 80 feet into the Channel from the existing bulkhead line, then taper toward the existing bulkhead. The existing channel is approximately 500 feet wide in this area. At Summer Street, the new deck will project 40 feet from the existing bulkhead line; at Congress Street it will project 15 feet into the Channel; at a point 100 feet north of Congress Street the new bulkhead will meet the existing bulkhead line. A total of 88,500 square feet, or 9.5 percent of the Channel will be occupied by the Preferred Alternative.

Of the structures which span the Channel, only the Old Colony Railroad Bridge will be removed by the Preferred Alternative. On the Boston side of the Channel, the Summer Street Bridge will have one span dismantled and reconstructed; following construction, the bridge's profile and symmetry will be the same as at present. Congress Street Bridge will not be affected.

The construction of a Seaport Access Tunnel through South Boston will displace two buildings (40 Wormwood Street and 293 A Street) in the Boston Wharf Company section of the Fort Point Channel District. These buildings do not contribute to the significance of the district, nor does the architectural significance of the buildings qualify them for eligibility for the National Register. Removal of these buildings will not affect the integrity of the District.

A 10-story ventilation building measuring approximately 80 feet by 90 feet will be constructed on the proposed filled portion of the Channel south of Dorchester Avenue.

During construction, vehicular and water access to the Fort Point Channel area will be disrupted as a result of successive closing or reduction in width of the bridges, the placement of steel sheeting in the Channel, and the presence of barges



Boundary of Historic District

Figure 82

Impacts on the Fort Point Channel Historic District

0 800 Feet

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

gen

ern end of the Channel filled.

olony Railroad Bridge removed.

ne-story buildings in Boston Wharf Company section of strict removed; buildings do not contribute to significance trict.

bulkhead line at southern end of Channel located near ng Dorchester Avenue Bridge.

ric bulkhead line on Boston side of Channel altered by construction of two-lane, northbound new Dorchester Avenue which ds 30 feet inside existing bulkhead line from Dorchester ue to a point 400 feet south of Summer Street Bridge; pedes- walk hung on new bulkhead projects additional 10 feet channel

point 5, new Dorchester Avenue built on slurry walls with k-out panels to allow water to pass through, and a false bulk- of granite with a 10 foot adjacent pedestrian walk hung above r surface.

7. In 400 feet south of Summer Street, pedestrian deck constructed on top of tunnel box as it rises above low water line. False bulkhead follows perimeter of deck, projecting maximum of 80 feet beyond existing bulkhead line. One span of Summer Street Bridge on Boston side of Channel dismantled and reconstructed; final profile and symmetry same as existing.

8. Between Summer and Congress Street Bridges, the deck and Dorchester Avenue taper toward existing bulkhead. False bulkhead at perimeter of deck projects 40 feet from existing bulkhead line at Summer Street and 15 feet from existing bulkhead line at Congress Street. Congress Street Bridge not altered.

9. New bulkhead meets existing bulkhead line 100 feet north of Congress Street.

and construction equipment. The construction activities themselves may also affect the area and its use as a result of construction-related noise, dust, and vibration.

There will be additional construction impacts in the Boston Wharf Company section of the Fort Point Channel District, including construction noise, dust, and vibration impacts on this area's industrial and commercial buildings, a number of which have been recently rehabilitated.

Alternatives Which Would Avoid the Section 4(f) Property

No alternative which provides a cross-harbor tunnel connection can entirely avoid the southern end of the Fort Point Channel District and the historic Old Colony Railroad Bridge because of the need to connect with the Massachusetts Turnpike, whose terminus lies immediately west of the Channel District. An alignment which crossed the Fort Point Channel area at a location south of the Gillette property was examined and rejected. This alternative is operationally infeasible, since it required the highway tunnel to pass under the MBTA Red Line tunnel and then rise to connect to the Massachusetts Turnpike. This alignment is not possible in the short distance allowed for this connection. Alternatives which did not include a cross-harbor tunnel connection were examined in the DEIS/DEIR and SDEIS/SDEIR; they did not provide the desired traffic improvements on the Central Artery and in the existing tunnels, and were rejected.

A second major objective of the project, providing additional north-south expressway capacity in this segment of the Central Artery corridor, requires construction in the Channel District under all build alternatives studied in both the DEIS/DEIR and the SDEIS/SDEIR. Alternatives which did not include providing additional capacity in this segment of the Central Artery were examined in the DEIS/DEIR and SDEIS/SDEIR; they did not provide the desired traffic improvements on the Central Artery, and were rejected. Other alternatives which would avoid or reduce this use of land within the district were considered. Specifically, conceptual feasibility studies were made during the preparation of the SDEIS/SDEIR of (a) widening the Dewey Square Tunnel, (b) construction of a new four-lane tunnel beneath Atlantic Avenue, (c) construction of the Central Artery northbound tunnel under existing Dorchester Avenue on Postal Service land, and (d) elimination from the project of additional Central Artery capacity in the Dewey Square area.

(a) Widening of Dewey Square Tunnel was considered and rejected because widening this tunnel would cause extensive commercial relocations in the Leather District and Chinatown and residential relocations in Chinatown (a total of 27 relocations and/or underpinnings); these takings would occur within the potentially eligible Chinatown Historic District and the eligible Leather District, which experience no effect under the Preferred Alternative. There would also be Section 4(f) impacts to the Chinese Gate park and the adjacent basketball court.

(b) A tunnel under Atlantic Avenue was also considered and rejected because it poses major engineering difficulties. It would involve major disruption to the MBTA Red Line mezzanine at South Station and the proposed intermodal transit connection; greater utility relocations, including the need to relocate the Boston Water and Sewer Commission 96-inch combined sewer from Atlantic Avenue into the Channel; and alignment problems at the Turnpike/Expressway/local street interchange and the South Station garage ramps. In addition, because of downtown Boston access needs, new Dorchester Avenue would also be required in this avoidance alternative in order to avoid serious traffic congestion on local streets as in the

Preferred Alternative; it would therefore involve land within the Fort Point Channel District. See the separate volume of this report "Two-Lane Tunnel/Optional Fort Point Channel Concepts" for a detailed analysis of this concept.

(c) A tunnel under existing Dorchester Avenue, which is owned by the Postal Service and closed to other traffic south of Summer Street, was also considered and rejected for the following reasons. Construction period disruption to operations at the South Postal Annex would be substantial; this facility processes all U.S. Mail for the Boston region and requires access to its loading docks directly from Dorchester Avenue. The Postal Service also requires the provision of northbound access to the Central Artery and Surface Artery from the South Cove area; in order to provide access for both Postal Annex trucks and general traffic, a new Dorchester Avenue would have to be built on pile supports and located in the Channel. With this alternative, Postal Service operations would be disrupted by construction of a tunnel under Dorchester Avenue, and the project would still involve the introduction of a roadway within the Channel; therefore, disruptions would be substantially greater than from the Preferred Alternative, and the alignment would still involve impacts in this section of the Channel District. An analysis of the concept of a tunnel under Dorchester Avenue is contained in the separate volume of this report, "Two-Lane Tunnel/Optional Fort Point Channel Concepts".

(d) The concept of not expanding north-south capacity in this segment of the Central Artery corridor was studied; i.e., leaving the existing Dewey Square tunnel with six lanes and omitting the northbound lanes from Fort Point Channel. This concept would fail to satisfy the transportation objective of improving Central Artery traffic flow and reducing congestion. Demand at Dewey Square would exceed capacity by 25 percent during peak hours and by 10 to 15 percent in the hours immediately before and after peak. Significant queuing would result and traffic flows would be disrupted throughout the Central Artery and on local streets in Downtown Boston and South Boston due to substantial traffic diversion from the Central Artery. Also, this concept does not avoid construction along the Fort Point Channel, since a pile-supported new Dorchester Avenue would still be above the Channel to provide access from the south to the Central Business District.

As noted above, all build alternatives studied involved the use of potential Section 4(f) property in the Fort Point Channel District. The Preferred Alternative has substantially less impact on the Fort Point Channel area than any of the other build alternatives examined, except for Alternative 5A. Alternative 5A, which did not include a new Dorchester Avenue, failed to satisfy basic transportation objectives for improving Central Artery traffic flow and access to downtown Boston; for these reasons it was rejected. In comparison with the remaining alternatives, the Preferred Alternative reduces the width of the new Dorchester Avenue from four lanes to two lanes. The new Dorchester Avenue would extend only 30 feet into the Channel (plus the 10 foot pedestrian deck); in other alternatives it extended into the Channel as far as 110 feet. New Dorchester Avenue extends north only to Summer Street with the Preferred Alternative; in other alternatives it extended as far as Northern Avenue. The exposed area of the tunnel structure is also reduced with the Preferred Alternative, extending to a point 400 feet south of the Summer Street Bridge rather than to the Dorchester Avenue Bridge as with other alternatives. Additionally, the Preferred Alternative does not require ramps crossing the Channel at Summer Street which were required under several of the other build alternatives. For these reasons the Preferred Alternative represents the best alignment while minimizing

impacts in the Fort Point Channel area.

Mitigating Measures

Long-term mitigating measures include configuration of the ventilation building to reduce visual impact, use of granite facing to make the new bulkhead sections visually consistent with the existing bulkhead, reconstruction of existing bridges, and the creation of landscaping improvements and a pedestrian walkway along the Boston side of the Channel. During preliminary and final design, there will be continuing exploration of the possible use of up to 10 feet of Postal Service land now used for parking between the existing bulkhead south of Summer Street and the section of existing Dorchester Avenue used for Postal Service operations; the use of this land would further reduce the width of new Dorchester Avenue within the Channel.

Conclusion

Based upon the above considerations, it is determined that there is no feasible and prudent alternative to the use of land from the Fort Point Channel District and that the proposed action includes all possible planning to minimize harm to the Fort Point Channel District resulting from such use.

5.3 ARCHAEOLOGICAL SITES

A Phase I, Step 1 archaeological survey was performed during the preparation of the SDEIS/DEIR for the Preferred Alternative. The Phase I (Step 1) survey results indicated a high probability of locating archaeological resources in the following areas: South Bay/South Cove (prehistoric and historic), Fort Point Channel (historic), Fort Hill (historic), Central Artery corridor from Dewey Square to Causeway Street (prehistoric and historic), Logan Airport (historic), and South Boston corridor (prehistoric and historic).

As stated in the Section 106 Memorandum of Agreement, FHWA will ensure that a Phase I, Step 2/Phase II investigation is initiated 90 days following ratification of the Section 106 Memorandum of Agreement and release of funds for additional planning and design studies. This investigation will include, at a minimum, the following elements:

o preparation of an appropriate research design, outlining and justifying important research problems that may be addressed by investigation of archaeological properties in the project area; and

o a proposed scope of work and work plan for field investigation integrating the results of the following work:

- acquisition of additional historical documentary information on past disturbances that may preclude areas from field testing, and

- acquisition of additional historical documentary information concerning potential significance of historic and prehistoric archaeological remains.

This program for investigation, including the research design, scope of work, and work plan will be reviewed by MDPW and the SHPO prior to implementation.

Field testing and evaluation will be implemented based on the scope of work and work plan and in the context of the research design.

A written report describing the results of the documentary research, field testing and applied National Register criteria and containing recommendations on the significance of identified resources, will be provided to MDPW, the Massachusetts SHPO, and BLC. These recommendations will be subject to review by MDPW and the Massachusetts SHPO in consultation with BLC.

Based on the results of the

documentary research and field testing work, a plan will be developed in consultation with the SHPO and BLC that includes provisions for avoidance or preservation in place of significant archaeological remains, where feasible and practical, through design and engineering development or construction specifications as set forth above. If avoidance or preservation in place is not feasible and practical, and the SHPO concurs in this determination, the plan will include provisions for Phase III data recovery or other appropriate treatment. The plan will be submitted to the Massachusetts SHPO and the Advisory Council for review and approval in consultation with BLC prior to implementation.

At such time as the nature, extent, and locations of necessary utility line relocations are known, identification, evaluation, and treatment plan preparation and implementation will be done in the same manner as set forth above for any significant archaeological properties which may be affected by these activities.

All historic and archaeological investigations called for under these stipulations will be conducted by individuals who meet, and in a manner consistent with, the Advisory Council's standards and guidelines.

Conclusion

A determination has been made at this time that there are no feasible and prudent locations or alternatives for the action to avoid the use of Section 4(f) land. This determination has considered all possible planning to minimize harm to the extent that the level of detail available at the publication of this EIS/EIR allows. Upon completion of the Phase I, Step 2/Phase II Archaeological Survey, and in accordance with the Section 106 Memorandum of Agreement, appropriate measures will be developed to avoid, preserve in place or recover data from significant archaeological sites.

5.4 CONSULTATION

Consultation regarding the above parkland and historic sites, as required by federal Section 4(f) regulations, was initiated during the DEIS/DEIR through meetings and discussions with Federal, State and local agencies. This consultation process has continued during the preparation of this FEIS/FEIR as follows:

o Section 106 Memorandum of Agreement: developed through consultation with, and signed by, Massachusetts State Historic Preservation Officer, Boston Landmarks Commission, Massachusetts Department of Public Works, and FHWA; sent to the Advisory Council on Historic Preservation on 21 September 1983; revised by the Advisory Council and signed by FHWA on 24 February 1984, by the Advisory Council on 11 April 1984 and by MDPW on 28 February 1984. Design guidelines for joint development, preliminary and final design and construction specifications affecting historic areas for the project and joint development, and treatment of archaeological properties are subject to review by the Massachusetts State Historic Preservation Officer in consultation with Boston Landmarks Commission (see COMMENTS AND COORDINATION).

o City of Boston Parks and Recreation Department and Department of Environment: 9 August 1983 letter states concurrence with impact analysis and satisfaction with mitigating measures (see COMMENTS AND COORDINATION).

o Boston Landmarks Commission: meetings held 2 June 1983 regarding eligibility of properties, and on 27 July, 26 August, and 1 September 1983 regarding impacts and

mitigating measures. Section 106 Memorandum of Agreement signed 21 September 1983; Agreement revised and approved by the Advisory Council and signed by BLC 28 February 1984.

- Massachusetts Historical Commission (State Historic Preservation Officer): meeting held on 2 June 1983 regarding eligibility of properties; exchange of correspondence between FHWA and SHPO initiated on 21 June 1983; consultation on impacts and mitigating measures on 27 July, 26 August, and 1 September 1983; Section 106 Memorandum of Agreement signed 21 September 1983; Agreement revised and approved by the Advisory Council and signed by MHC 27 February 1984.

- Massachusetts Metropolitan District Commission: meetings held on 25 May 1983 and 26 July 1983; comments received from MDC Commissioner on 15 August 1983 indicating general concurrence and requesting mitigating measures which were subsequently incorporated in this FEIS/FEIR (see COMMENTS AND COORDINATION).

- U.S. Department of Housing and Urban Development: correspondence to HUD initiated on 12 May 1983; HUD response 19 May 1983 and 1 August 1983 indicating concurrence with impact assessment and appropriate mitigating measures (see COMMENTS AND COORDINATION).

- U.S. Department of the Interior, National Park Service: technical assistance review and comments requested, 12 May 1983; UPARR approval received 7 November 1983; Section 6(f) approval received 5 April 1984 (see COMMENTS AND COORDINATION).

- U.S. Department of the Interior: comments received 7 April 1983, 29 August 1983 and 4 October 1983 (see COMMENTS AND COORDINATION).

- Massachusetts Executive Office of Environmental Affairs, State Liaison Officer: Section 6(f) approval received 12 April 1984 (see COMMENTS AND COORDINATION).

The results of this consultation process are reflected in the discussions in this Chapter 5.0 of the FEIS/FEIR.

6.0 LEGAL AND FINANCIAL CONSIDERATIONS

The proposed financing of construction and operating costs for the Preferred Alternative is briefly presented below.

6.1 THIRD HARBOR TUNNEL - INTERSTATE ROUTE 90

The Commonwealth of Massachusetts, through its designated agencies, proposes to finance, construct and operate the Third Harbor Tunnel portion of the Preferred Alternative as a toll facility. As an extension of the easterly terminus of Interstate Route 90 (the Massachusetts Turnpike), the Third Harbor Tunnel will be eligible for federal aid under the Federal-Aid Interstate Highway Program for up to 90 percent of the construction-related costs. Federal participation in the construction of the Third Harbor Tunnel as a toll facility is conditioned upon compliance with the following provisions of Title 23 of the United States Code.

The tunnel and approaches to the tunnel must be publicly-owned and operated.

The Commonwealth must enter into an agreement with the United States Secretary of Transportation, providing that (a) all tunnel tolls, less the actual cost of operation and maintenance of the tunnel, shall be applied to the payment of the local share of the cost of construction of the tunnel, and (b) no tunnel tolls shall be charged after the local share shall have been repaid, and (c) the tunnel shall be operated as a free tunnel after the date of such repayment.

The 10 percent local share of the Third Harbor Tunnel construction costs, along with operating costs, may be financed by a variety of mechanisms. Among the possibilities are: tolls from the tunnels or other State facilities, State general obligation bonds, general State revenues, or some combination thereof. The Commonwealth's specific toll policy with respect to the Third Harbor Tunnel will be developed at a later, appropriate time, and may also change from time to time. As a matter of policy, the Commonwealth may charge different tolls for the new Third Harbor Tunnel than for the existing Callahan/Sumner Tunnels and Mystic-Tobin Bridge.

For purposes of illustration only, an analysis of estimated Third Harbor Tunnel tolls has been prepared assuming that the 10 percent local share and operating costs would be covered by tolls, and assuming equal tolls for the Third Tunnel and the Callahan/Summer Tunnels. Based on these assumptions, and using present day costs, a toll of approximately $0.45 per vehicle in each direction would be required with the implementation of one-way tolls; $0.90 per vehicle would be collected inbound only.

The specific assumptions used in estimating this illustrative toll figure were as follows.

It was assumed that the Commonwealth's 10 percent share of the construction costs (including funds as may be necessary to redeem the then outstanding existing tunnel revenue bonds) would be financed through the sale of revenue bonds.

The bond issue evaluated was based on 40-year revenue bonds at an interest rate of 7 percent. It included the Commonwealth's 10 percent share of construction costs, capitalized interest payments between the date of the bond issue and the time that revenues are available from the operation of the Third Tunnel, and financing and legal costs incurred in the preparation and sale of the bond issue.

The toll schedule required to finance this illustrative bond issue is dependent on the 1990 traffic forecasts (opening year) for the

existing tunnels and the Third Harbor Tunnel; estimated costs of operation and maintenance of the three tunnels; provision for a replacement reserve fund to cover the costs of insurance, equipment and major non-recurring repairs; and debt service costs. In addition, investors in revenue bonds require, as a safety cushion, coverage above the level annual debt service requirements to retire the bonds by maturity.

6.2 CENTRAL ARTERY - INTERSTATE ROUTE 93

The depressed Central Artery portion of the Preferred Alternative will be eligible for federal aid funding for up to 90 percent of the construction-related costs. The Central Artery will remain a toll-free facility. The Commonwealth's 10 percent share of the construction cost is anticipated to be financed through bonds issued by the Commonwealth. Financing of operating costs is expected to be undertaken by the Commonwealth in a manner similar to all other State facilities.

AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM THE FEIS/FEIR WERE SENT

The following list of Federal, State, regional and local agencies and other parties were sent copies of this FEIS/FEIR. Those who commented substantively on the DEIS/DEIR and SDEIS/SDEIR have been identified by means of an asterisk(*).

Federal:

*U.S. Environmental Protection Agency
*U.S. Department of Transportation - Secretarial Representative
*U.S. Department of Health and Human Services, Public Health Service
Federal Aviation Administration
*U.S. Department of the Interior
*National Marine Fisheries Services
*U.S. Army Corps of Engineers
*U.S. Coast Guard
U.S. Department of Housing and Urban Development
Urban Mass Transportation Administration
Federal Emergency Management Agency
*Federal Railroad Administration
Advisory Council on Historic Preservation
*General Services Administration
*U.S. Postal Service
Elected Officials:
Senator Edward M. Kennedy
Senator Paul E. Tsongas
Representative Thomas P. O'Neill, Jr.
Representative Edward J. Markey
Representative John J. Moakley
Representative Brian O'Donnelly
Representative Nicholas Mavroules

State:

Office of the Governor
Executive Office of Administration and Finance
*Executive Office of Environmental Affairs
Executive Office of Communities and Development
Executive Office of Economic Affairs
Executive Office of Public Safety
*Office of Coastal Zone Management
*Department of Environmental Quality Engineering/Northeast Region

State: (Cont.)

*Department of Environmental Quality Engineering/Division of Air Quality Control
Department of Environmental Quality Engineering/Division of Water Pollution Control
Massachusetts Aeronautics Commission
*Metropolitan Area Planning Council
*Metropolitan District Commission
Massachusetts Bay Transportation Authority
Massachusetts Turnpike Authority
*Massachusetts Port Authority
Central Transportation Planning Staff
*Massachusetts Historical Commission
Massachusetts Division of Marine Fisheries
Massachusetts Department of Environmental Management
Special Commission for the Development of Boston Harbor
Senator William J. Bulger
Senator Michael LoPresti, Jr.
Senator William Owens
Senator Joseph Walsh
Senator Royal Bolling, Sr.
Speaker Thomas McGee
Representative Emanuel "Gus" Serra
*Representative Michael F. Flaherty
Representative Salvatore DiMasi
Representative Angelo Marotta
Representative Byron Rushing
Suffolk County Sheriff Dennis Kearney

Local:

Office of the Mayor - Boston
Office of the Mayor - Cambridge
Office of the Mayor - Chelsea
Office of the Mayor - Revere
Office of the Mayor - Somerville
Office of the Mayor - Lynn
*Boston Conservation Commission
*Boston Redevelopment Authority
*Boston Traffic and Parking Department
*Boston Water and Sewer Commission
Boston Public Works Department
Boston Parks and Recreation Department
*Boston Economic Development and Industrial Commission
Boston Department of the Environment

Local: (Cont.)

*Boston Landmarks Commission
Boston Police Department
Boston Fire Department
Boston City Clerk
Boston City Council
Boston Neighborhood Development Agency

Private:

*Greater Boston Chamber of Commerce
East Boston Chamber of Commerce
Greater Boston Community Development Corporation
South Boston Citizens Association
South Boston/Neighborhood House
South Boston Information Center
South Boston Residents Group
South Boston Community Development Corporation
South End Committee on Transportation
Ellis Neighborhood Association
East Boston Fair Share
East Boston Jets Club
East Boston Veterans Council
Jeffries Point Harborside Association
Chinatown Housing and Land Development Task Force
Chinese Merchants Association
Chinese Economic Development Council
Haymarket Pushcart Association
North End Health Center
Sons of Italy
Boston Educational Marine Exchange
Boston Harbor Association
The Harbor Associates
Harbor Design
*Boston Preservation Alliance
Fort Point Arts Community
*Boston Society of Architects
Boston Aviation Council
*Coalition Against The Third Harbor Tunnel
*League of Women Voters
League of American Wheelmen
Association for Public Transportation, Inc.
*Sierra Club
Massachusetts Audubon Society
*American Lung Association
*Eastern Airlines
*The Gillette Co.
Bay State Spray & Provincetown Steamship Co.
*Boston Wharf Company
Museum Wharf Company
New Boston Garden Corporation

Private: (Cont.)

150 (Causeway) Trust
Cabot, Cabot & Forbes
Paul Revere House
North End Neighborhood Council
Stone and Webster Engineering
*Macomber Development Co.
Boscom
Standex International Corporation
*Boston Tea Party Museum
*The Stop & Shop Company
Boston Edison Company
*Conservation Law Foundation
Conrail
*Marullo and Barnes
*Mr. Justin Gray

Study Committees/Participation

An important part of the coordination efforts for this study was community participation.

Public input during the EIS/EIR study was obtained by the use of two committees:

The Interagency Committee's emphasis was on the technical aspects of the study, and included the following agencies:

Federal - Environmental Protection Agency, Federal Aviation Administration, Federal Highway Administration, Fish and Wildlife Service, National Marine Fisheries Service, Army Corps of Engineers, Coast Guard.

State - Central Transportation Planning Staff, Office of Coastal Zone Management, Department of Environmental Quality Engineering/Northeast Region, Department of Environmental Quality Engineering/Division of Air Quality Control, Executive Office of Communities and Development, Executive Office of Economic Affairs, Executive Office of Environmental Affairs, Executive Office of Transportation and Construction, Massachusetts Aeronautics Commission, Massachusetts Department of Public Works, Metropolitan Area Planning Council, Metropolitan District Commission, Massachusetts Bay Transportation Authority, Massachusetts Port Authority, Massachusetts Turnpike Authority.

City of Boston - Boston Redevelopment Authority, Boston Traffic and Parking Department, Boston Water and Sewer Commission, Department of Public Works. (The Interagency Committee also included two community representatives (one from East Boston and one from South Boston) that are also members of the Working Committee.)

The Interagency Committee met 15 times through preparation of the FEIS/FEIR.

At each meeting the agencies were updated as to the study progress, were briefed on the alternatives, and were presented information on existing conditions in the project area. Potential impacts of the project were also presented as they were identified and quantified in the areas of urban design/joint development, traffic projections, air quality, water quality, noise and vibration, relocation of businesses, construction staging costs, historical/archaeological resources, neighborhood facilities, land use, Section 4(f) lands, and economic impacts.

The Working Committee provided close contact with community and neighborhood representatives for input on technical matters about the study. This Committee was formed from interested community groups, private individuals and business interests in the project area. The Committee was open to all residents, community organizations, individuals, business interests, and agency representatives. The Working Committee met 13 times through preparation of the FEIS/FEIR. Meetings were announced by mailing notices to over 800 individuals.

Ongoing Agency Coordination

Additional meetings for continual coordination were held with many of the previously listed agencies. The following agencies not on the Interagency Committee were contacted for data on their facilities and/or their concerns relating to the project: Boston Educational Marine Exchange, Boston Harbor Associates, Boston Landmarks Commission, City of Boston Department of the Environment, Boston Conservation Commission, Boston Fire Department, Boston Neighborhood Development Agency, Boston Parks and Recreation Department, Boston Police Department, Federal Census Bureau, General Services Administration, Greater Boston Chamber of Commerce, Massachusetts Historical Commission, U.S. Post Office, East Boston Land Use Advisory Council, and the East Boston Chamber of Commerce.

Ongoing Private Group Coordination

Also involved in coordination efforts for the project were the following private companies: Amtrak; Conrail; Boston & Maine Railroad; Eastern Airlines; Boston Edison Co.; Jung/Brannen Associates; The Gillette Co.; New England Aquarium; Camp Dresser & McKee, Inc.; America East Corporation; Bethlehem Steel Co. (East Boston); New England Medical Center; New England Telephone Co.; Boston Gas Co.; Cabot, Cabot & Forbes; Boston Wharf Co.; Macomber Development Associates; and Stone and Webster.

Other Community Participation

Besides the Working Committee meetings mentioned previously, community participation activities included seven public meetings, three open houses, and a two-day public hearing on the project. All public meetings were advertised in the local newpapers.

A newletter was also developed which was published three times during the course of the study. Three thousand copies of each addition of Update were published. Each edition of Update had a broad mailing list of approximately 800 individuals and organizations, besides being distributed at public libraries, meetings and by other means. Five thousand copies of a fourth newsletter, IN BRIEF, were printed and were widely distributed through the mail, to libraries, and at public meetings. This last newletter provided a concise summary of the DEIS/DEIR and SDEIS/SDEIR findings and process.

During the DEIS/DEIR phase, two project field offices were maintained in downtown Boston and East Boston. During the SDEIS/SDEIR phase, two project field offices were also maintained, one in downtown Boston and another in South Boston. At the field offices, plans of the alternatives were on display, along with other project material. Each office was staffed two to three afternoons per week.

The participation staff mailed information relevant to the project as requested. This information included the scope of work of the study, plans of the alternatives, minutes of meetings, handouts distributed at meetings, and newspaper articles.

A more detailed description of public participation during the DEIS/DEIR phase is contained in Appendix 2 of that document.

Disposition of Comments

Written comments on the DEIS/DEIR and SDEIS/SDEIR, and responses to these written comments ar contained in Volume 2 of this FEIS/FEIR. Written public hearing testimony and responses to that testimony are also contained in that volume. Verbal public hearing testimony and written responses to tha testimony are contained in the Public Hearing: Synopsis, Responses to Verba Comments, and Transcript report of thi FEIS/FEIR.

Specific Agency Cordination

As evidence of ongoing coordination during the EIS/EIR phase, the following major outcomes are presented:

Metropolitan Planning Organization (MPO) Statement

The MPO for the Boston Region, including the Massachusetts Executive Office of Transportation and Construction, the Metropolitan Area Planning Caouncil, the Massachusetts Department of Public Works, the Massachusetts Port Authority, and the MBTA Advisory Board, have concurred that Alternative 5A Modified is their Preferred Alternative for the Central Artery/Third Harbor Tunnel Project (Exhibit A at the end of this section)

Section 106 Determinations of N Effect

The Massachusetts Historic Commission has concurred with FHWA's Determination of No Effect, pursuant

with Section 106 of the National Historic Preservation Act of 1966 (Exhibit B at the end of this section).

Section 106 Memorandum of Agreement

Pursuant with Section 106 of the National Historic Preservation Act of 1966, the Federal Highway Administration, the Massachusetts Department of Public Works, the State Historic Preservation Officer (Massachusetts Historic Commission), the Boston Landmarks Commission, and the Advisory Council on Historic Preservation have executed a Memorandum of Agreement to mitigate the adverse effects of the proposed project on historic and archaeological properties included in, or eligible for inclusion in the National Register of Historic Places (Exhibit C at the end of this section). The case report which contributed to the basis for this Memorandum of Agreement is included as Exhibit D.

Section 4(f) Consultation

Exhibit E at the end of this section is a reply from the City of Boston Parks and Recreation Department to the Commonwealth's request for a statement of significance as a recreational resource, and assessment of potential project impact, pursuant with Section 4(f) of the U.S. Department of Transportation Act of 1966.

Consistency with Massachusetts Coastal Zone Management Program

The Massachusetts Department of Public Works has submitted its Federal Consistency Certification to the Massachusetts Office of Coastal Zone Management (CZM) under the CZM Program for their concurrence (Exhibit F at the end of this section).

Commitment to Ongoing Coordination and Environmental Documentation

Commitments to ongoing project coordination and environmental documentation include the following:

(1) Commitment to the U.S. Environmental Protection Agency to perform detailed air quality analysis of detour routes during construction.

(2) Commitment to EPA, the U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service to undertake environmental analysis and documentation of tunnel fabrication sites.

(3) Phase I, Step 2 and Phase II archaeological surveys.

(4) Commitment for ongoing historic and archaeological impact consultation and mitigation under executed Section 106 Memorandum of Agreement.

(5) EOTC/MDPW commitment to Massachusetts Executive Office of Environmental Affairs (EOEA) to continue environmental process for analysis and documentation of potential impacts of stage construction and construction methods beyond the FEIS/FEIR stage of this project.

(6) EOTC/MDPW commitment to EOEA for further traffic analysis documentation beyond the FEIS/FEIR stage of this project.

(7) Commonwealth's commitment to engage in an open participatory process with the City of Boston, the community, business interests, and other affected parties for joint development of the 20 acres of air rights parcels above the depressed Central Artery.

EXHIBIT A

The Commonwealth of Massachusetts

Executive Office of Transportation & Construction
One Ashburton Place
Boston, Massachusetts 02108

·CH.EL S. DUKAKIS
GOVERNOR

·ED ?ICK P. SALVUCCI
SECRETARY
AND
3TA CHAIRMAN

Boston Region MPO Statement of Preferred Alternative

In accordance with Section 771-125 of the Rules and Regulations outlined in the Federal Register dated October 30, 1980 requiring that a final EIS contain the MPO's views on the preferred alternative for a given project in an urbanized area, the following statement is made.

We, the undersigned constituting the MPO for the Boston region, do hereby concur that for the Central Artery/Third Harbor Tunnel project, Alternative 5A Modified is our preferred alternative.

With implementation of the project in accordance with this alternative, we believe that positive impacts can be achieved on traffic safety and congestion, air quality, the physical and visual environment, economic development and general amenities for residents of the affected areas.

Furthermore, our preferred alternative, in addition to the general positive aspects noted above, can specifically protect the functional and visual characteristics of Fort Point Channel, provide improved access to the South Boston Seaport area, and traffic diversion from the Central Artery, as well as improved access to Logan Airport with reduced congestion in the existing tunnels and Central Artery.

Signed: Date:

Frederick P. Salvucci 9/23/83
Frederick P. Salvucci
Secretary of Transportation
and Construction
MPO Chairman

Robert T. Tierney 9/23/83
Robert T. Tierney
Commissioner
Massachusetts Department
of Public Works

James F. O'Leary 9/26/83
James F. O'Leary
General Manager
Massachusetts Bay
Transportation Authority

Signed: Date:

Elizabeth A. Bransfield 9/26/83
Elizabeth A. Bransfield
President
Metropolitan Area
Planning Council

Robert M. Weinberg 9/26/83
Robert M. Weinberg
Chairman
Massachusetts Port
Authority

Antonio J. Marino
Antonio J. Marino
Chairman
MBTA Advisory Board

CITY OF BOSTON
OFFICE OF THE MAYOR
CITY HALL, BOSTON

KEVIN H. WHITE
MAYOR

August 22, 1983

Mr. James Walsh
Division Administrator
Federal Highway Administration
55 Broadway, 10th Floor
Cambridge, Massachusetts 02124

Dear Mr. Walsh:

After careful review of the Supplement to the Draft Environmental Impact Statement/Report on the proposed depression of the Central Artery; and after extensive community input from impacted neighborhoods; I wish to extend my endorsement for the widening and depression of the Central Artery.

I favor a depressed Central Artery because it will reduce traffic congestion throughout the downtown core and reduce air and noise pollution in Boston. Elimination of the elevated roadway will also remove a blighting influence from our downtown. In doing so, we will reunite the city with its waterfront.

This project takes on added importance when we consider the major reconstruction required on the Central Artery in the future. To rebuild an elevated roadway that does not address the city's transportation needs, present or future, would be a waste of public funds.

There is no doubt in my mind that the existing congestion on the Central Artery is acting as a detriment to economic development in this city and in this region. We should not tolerate any component in our transportation system which is an obstacle to economic growth. In fact, as Mayor of Boston, I feel the depression of the Artery will provide us with development parcels that could generate a new era of development in this city. The Boston Redevelopment Authority, the city planning agency, should play a lead role in formulating a development program for these air-rights parcels.

With respect to the proposed Third Harbor Tunnel, I am strongly opposed to both the East Boston railroad and Jeffries Point Cove alignments because of their destructive effects on the East Boston community. I also have serious reservations about the impact of the airport alignment on East Boston Stadium. In fact, that alignment is unacceptable as currently designed. Furthermore, the potential linkage between any additional harbor crossing and future growth at Logan Airport is a fundamental concern that can only be addressed by policies and programs of the Commonwealth of Massachusetts. Finally, I could never support any tunnel alignment unless and until there is a prior commitment to depress and widen the Central Artery.

In conclusion, I believe that the depression and widening of the Central Artery will be a significant and necessary improvement to the transportation infrastructure of the City. It will ensure that Boston's economic growth continues, while we improve the quality of life for residents of and visitors to the Downtown Core.

Sincerely,

Kevin H. White

Kevin H. White
Mayor

EXHIBIT B

Boston Tunnel

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
55 Broadway - 10th Floor
Cambridge, MA 02142

IN REPLY REFER TO:
HEV-MA

I-90-1(1)0 Third Harbor Tunnel/Central Artery
Determinations of No Effect

September 7, 1983

Ms. Patricia Weslowski
State Historic Preservation Officer
Massachusetts Historical Commission
294 Washington Street
Boston, Massachusetts 02108

Dear Ms. Weslowski:

The Draft EIS and the supplemental Draft EIS for the above proposed project described properties in the project area that are potentially eligible, elegible for or on the National Register. Based upon the information in these documents and discussions at meetings attended by MHC and FHWA staff, we believe that the proposed project will have no effect on the following properties:

- Butler Aviation Hangar
- South Station Headhouse
- South End National Register District
- Boston Leather District
- Bulfinch Triangle District
- Cornhill District
- Essex/Kingston Textile District
- Chinatown District
- Boston City Hall
- Old Waterfront District
- United Shoe Machinery Corporation
- Fish Pier
- Charles River Basin District
- Commonwealth Pier
- Exchange District
- Old West Church
- First Harrison Gray Otis House
- Old State House
- Carter/Winthrop Building
- (Former) Federal Reserve Bank
- 272-276 Franklin Street
- Commercial Palace District

If you concur with our findings of no effect please sign your name on the line below and return the letter to this office. The proposed project will have an effect on other historic properties. These determinations of effect will be handled by separate correspondence. If you have any questions about this matter please call Frank Bracaglia at 494-2253.

Patricia L Weslowski
Patricia Weslowski
State Historic Preservation Officer
Massachusetts Historic Commission

Edwin P. Holahan
Edwin P. Holahan, Assistant
Division Administrator
Federal Highway Administration

cc: Mr. R. Plourde, HFMW

EXHIBIT C

MEMORANDUM OF AGREEMENT

WHEREAS, the Federal Highway Administration (FHWA) has determined [th]at the Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93 [w]ill have an adverse effect upon properties included in or eligible for [i]nclusion in the National Register of Historic Places and has requested the [c]omments of the Advisory Council on Historic Preservation (Council) pursuant [t]o Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) [a]nd its implementing regulations, "Protection of Historic and Cultural [P]roperties" (36 CFR Part 800),

NOW, THEREFORE, FHWA, the Massachusetts State Historic Preservation [O]fficer (SHPO), and the Council agree that the undertaking shall be [i]mplemented in accordance with the following stipulations in order to take [i]nto account the effects of the undertaking on historic properties.

Stipulations

1. HISTORIC AMERICAN BUILDING SURVEY (HABS) / HISTORIC AMERICAN [E]NGINEERING RECORD (HAER) RECORDING.

FHWA will ensure that prior to alteration or demolition of the [p]roperties listed below, HABS/HAER (National Park Service, Mid Atlantic [R]egional Office, 143 South Third Street, Philadelphia, PA., 19106; Mr. John [?]nedak (215) 597-1577) will be contacted to determine the level of [d]ocumentation required to provide a permanent record of the properties. [F]irst, a list of the properties, with a summary of their National Register [s]ignificance (the description given in the case report), will be forwarded [t]o HABS/HAER. All documentation must be accepted by HABS/HAER and the [M]assachusetts State Historic Preservation Officer (SHPO) prior to alteration [o]r demolition of the properties.

[T]his stipulation refers to the following list of properties:

[F]ort Point Channel
[S]ummer Street Bridge
[O]ld Colony Railroad Bridge
[C]harles River Building
[S]top and Shop Building

2. FORT POINT CHANNEL DESIGN DEVELOPMENT GUIDELINES

FHWA will ensure that design development in this area will include the following:

a. Design and location of the ventilation building in a manner that is sympathetic to, and respectful of, the characteristics of surrounding historic properties with regard to massing, color, building material, detail, and scale.

b. Granite facing will be used in the new section of the Fort Point Channel bulkhead to make it visually consistent with the existing bulkhead in color, texture, configuration, and design.

c. Reconstruction of the one span of the Summer Street Bridge removed during project construction will be in a manner that reuses as much original fabric as possible and results in the same configuration as the original.

d. Landscaping improvements along the Boston side of the Channel will be designed to enhance those characteristics of the historic district that make it eligible for listing in the National Register of Historic Places.

e. During preliminary project design, there will be continuing study and negotiation with the U.S. Postal Service concerning the use of land between the existing Dorchester Avenue and the Channel bulkhead for project right-of-way. The final design of the new Dorchester Avenue will be such as to minimize impacts to the historic characteristics of Fort Point Channel and adjacent historic resources, including impacts related to pedestrian and vehicular traffic flow.

f. Preliminary and final design, and construction specifications, will be submitted to the Massachusetts SHPO, prior to start of construction, for review and approval in consultation with the Boston Landmarks Commission (BLC) regarding consistency with the design development guidelines outlined above.

3. STOP AND SHOP BAKERY BUILDING LOADING DOCK RELOCATION.

FHWA will ensure that the loading facilities of the Stop and Shop Bakery Building, a building included in the Causeway/North Washington Streets District, a property eligible for listing in the National Register, will be modified either to continue present operations or to serve an alternative building use with lesser loading requirements, in order to

nsure the continued economic viability of the building. Preliminary and nal design and construction specifications for the building modification hall be reviewed and approved by the SHPO in consultation with the BLC.

4. REVIEW OF DESIGN AND CONSTRUCTION SPECIFICATIONS

FHWA will ensure that potential adverse construction effects on all istoric properties described in its Preliminary Case Report are minimized r avoided through appropriate preliminary and final design and construction pecifications, reviewed and approved by the SHPO in consultation with the LC, and through the appointment to the project design team by the MDPW a roject Conservator. The Project Conservator's job description and ualifications shall be approved and his/her ongoing responsibilities eviewed by the SHPO in consultation with the BLC. The Conservator's esponsibilities shall involve overseeing the development of measures for itigating the adverse effects of construction on standing historic roperties. These mitigation measures shall be included as part of the onstruction specifications.

5. JOINT DEVELOPMENT DESIGN GUIDELINES

a. FHWA will ensure that potential adverse effects (as efined in Section 800.3(b) of the Council's Regulations, "Protection of istoric and Cultural Properties" (36 CFR Part 800)) from the use of ir-rights and other joint development ventures, and the development of entilation structures, and surface street improvements on historic roperties described in FHWA's Preliminary Case Report will be minimized or voided through appropriate design. Design guidelines will be developed by he Massachusetts Department of Public Works, in consultation with the assachusetts SHPO, BLC, and other interested groups, for joint development ffecting such properties.

b. Preliminary and final design and construction pecifications for joint development ventures, as they affect historic roperties described in FHWA's Preliminary Case Report, will be reviewed and pproved by the Massachusetts SHPO in consultation with BLC for consistency ith the above design guidelines. The MDPW shall ensure, as a condition to isposal of joint development and air rights parcels, compliance with this tipulation prior to and following parcel disposition.

6. ARCHAEOLOGY

A. Identification and Evaluation

1. Based on the preliminary Phase I (Step 1) survey work already conducted, FHWA shall ensure that a Phase I, Step 2/Phase II archaeological investigation of the project's proposed area of environmental impact be conducted in consultation with the MDPW, SHPO and BLC. This investigation will be initiated 90 days following ratification of this Agreement and release of funds for additional planning and design studies. This investigation shall include, at a minimum, the following elements:

(a) Preparation of an appropriate research design, outlining and justifying important research problems that may be addressed by investigation of archaeological resources in the project area, and a proposed scope of work and work plan for field investigation integrating the results of the following:

(1) Acquisition of additional historical and engineering/utility documentaton on past disturbances that may preclude areas from field testing;

(2) Acquisition of additional historical documentary information concerning potential significance of historic and prehistoric archaeological sites and their eligibility for nomination to the National Register of Historic Places.

(b) This program for investigation including the research design, scope of work and work plan will be reviewed by MDPW and the SHPO prior to implementation.

2. Implementation of field testing and evaluation based on the scope of work and work plan and in the context of the research design.

3. A written report describing the results of the documentary research, field testing and applied National Register criteria 36 CFR Part 63 and containing recommendations on the significance of identified resources, will be provided to MDPW, the Massachusetts SHPO, and BLC. These recommendations will be subject to review by MDPW and the Massachusetts SHPO in consultation with BLC.

B. Treatment and Additional Studies

Based on the results of the documentary research and field testing work, a plan will be developed in consultation with MDPW, the Massachusetts SHPO and BLC that includes provisions for avoidance or preservation in place of significant archeological remains, where feasible and practical, through design and engineering development or construction specifications as set forth in Stipulation 4 above. If avoidance or preservation in place is not feasible and practical, and the Massachusetts SHPO concurs in this determination, the plan will include provisions for Phase III data recovery or other appropriate treatment consistent with the Council's Handbook, <u>Treatment of Archaeological Properties</u> (Attachment 1). The plan will be submitted to the Massachusetts SHPO and the Council for review and approval in consultation with BLC prior to implementation.

C. Performance Standards

1. All historic and archaeological investigations called for under Stipulation 5.a. and b. above will be conducted by qualified individuals who meet, at a minimum, the appropriate qualifications in "Professional Qualifications" contained in the Secretary of the Interior's <u>Standards and Guidelines for Archeology and Historic Preservation</u> (Attachment 2) and in a manner consistent with those Standards and Guidelines and the Council's <u>Handbook</u> (Attachment 1).

2. Curation arrangements and materials conservation will be agreed upon by the MDPW and Massachusetts SHPO in consultation with BLC. Copies of final technical reports and papers resulting from the investigations will be provided to the Massachusetts SHPO, the National Park

Service, BLC, interested local academic institutions, and the Council. A camera ready copy of a popular report suitable for local public dissemination describing the results of any significant archaeological data recovery will be prepared for the project.

7. The Massachusetts SHPO shall review within 30 days of receipt any documents submitted by FHWA in accordance with any of the stipulations written above. Failure by the Massachusetts SHPO to respond within 30 days of receipt of any complete documents from FHWA shall be deemed to constitute full approval of such documents under the stipulations written above. If the Massachusetts SHPO and FHWA fail to agree, then the agency shall submit documentation to the Council and request consultation under 36 CFR 800.6.

Execution of this Memorandum of Agreement evidences that FHWA has afforded the Council a reasonable opportunity to comment on the Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93 and its effects on historic properties and the FHWA has taken into account the effects of its undertaking on historic properties.

James A. Walsh (date) 2/24/84
Federal Highway Administration

Patricia L. Weslowski (date) 2/27/8
Massachusetts State Historic
Preservation Officer

Marcia Myers (date) 2/29/8
Executive Director
Boston Landmarks Commission

Robert J. McDonagh (date) 2-28-8
Chief Engineer
Massachusetts Department of Public Works

Robert Garvey (date) April 5, 1984
Executive Director
Advisory Council on Historic Preservation

Alexander Aldrich (date) 4/11/84
Chairman
Advisory Council on Historic Preservation

EXHIBIT D

PRELIMINARY CASE REPORT ON HISTORIC PROPERTIES
Third Harbor Tunnel, Interstate 90
Central Artery, Interstate 93
Boston Massachusetts

19 September 1983

1. From Title 23, United States Code, "Highways", the Federal Highway Administration (FHWA) is authorized to expend funds appropriated from the Highway Trust Fund for Construction of Federal-Aid Highways. Applicable implementing regulations, procedures, and guidelines are contained in the Federal-Aid Highway Program Manual Volumes 1 through 7.

2. No decisions made yet on location approval or extent of Federal Aid funding.

3. Both DEIS and Supplemental DEIS have been circulated. The target date for completion of the FEIS is 30 September 1983.

4. Summary description of project from FEIS is attached.

5. <u>Description of National Register and Eligible Properties</u>

A. Properties which will be adversely affected through permanent destruction or alteration are as follows (numbers correspond to attached project area map):

1. <u>Fort Point Channel District</u> (1880 - 1930's) - potentially eligible National Register District, based on SHPO/FHWA consultation, with input from the Boston Landmarks Commission.

The Fort Point Channel area, including the Channel itself, the bridges over it, and the wharves, warehouses and transportation facilities on either side of it, comprise a physical record of the complex transportation developments which necessarily accompanied the rapid industrial expansion of Boston in the late nineteenth and early twentieth centuries, and is a symbolic vestige of the original Shawmut Peninsula. It is potentially eligible for the National Register.

The district includes the following contributing elements.

a. <u>The Fort Point Channel</u> (ca. 1890's).

Historic waterway bordered by granite bulkheads, created as part of late nineteenth century industrial/ transportation development of South Boston.

b. <u>The Northern Avenue Bridge</u> (1908).

Pivotal lift swing bridge; it has been determined eligible for the National Register.

Alternative 5A Modified: Central Artery Depression With Third Harbor Tunnel Via South Boston (Seaport Alignment)

This alternative increases traffic capacity on the Central Artery (north-south) by widening and depressing the existing viaduct (total length approximately 3.6 miles); cross-harbor vehicular capacity (east-west) is increased by construction of a Third Harbor Tunnel through South Boston linking the Massachusetts Turnpike/Central Artery interchange in Boston with Bird Island Flats, Logan Airport, and Route 1A in East Boston (total length approximately 3.6 miles). The Third Harbor Tunnel alignment is also called the Seaport Alignment because it provides direct access to and from the regional highway system and the northern "seaport" sector of South Boston. Figure 2 presents the proposed Alternative 5A Modified alignment. Figure 3 presents typical sections of the depressed Central Artery and the Third Harbor Tunnel, (not included but also a possibility is a binocular steel tunnel for the cross harbor sunken tube).

Central Artery Corridor

In the South Bay and Fort Point Channel areas, this alternative proposes construction of a four-lane tunnel within and along the west edge of the Channel from the Massachusetts Turnpike/Central Artery/Southeast Expressway interchange area to north of Dewey Square. This new tunnel will carry all northbound Central Artery traffic while five lanes of the Dewey Square Tunnel will be converted to southbound operation (serving both local access and through traffic). The profile of the Central Artery tunnel has been designed so that the tunnel box is below the bottom of the Fort Point Channel except where it crosses over the Massachusetts Bay Transportation Authority's (MBTA's) Red Line Tunnel. In plan view, the alignment curves to the west, north of Summer Street, to further avoid encroachment and impacts to the Fort Point Channel.

North of the Dewey Square Tunnel, the existing six-lane Central Artery will be depressed and widened to eight lanes (four lanes in each direction plus weaving lanes), in a new tunnel structure, to the vicinity of Causeway Street at North Station; it will be located principally within the existing Central Artery corridor, and will pass over the MBTA's Blue Line Tunnel at State Street. North of Causeway Street, the depressed Artery emerges through a portal and transitions to a viaduct, crossing over the Charles River on two truss bridges, rejoining the existing elevated Interstate Route 93 double-decked viaduct approximately 700 feet north of the Gilmore Bridge in Charlestown.

The existing Central Artery viaduct, the double-decked High-Level bridge over the Charles River, and portions of the recently constructed double-decked Interstate Route 93 structure in Charlestown will be removed after the new bridges become operational.

A major interchange with the Massachusetts Turnpike/Central Artery/Southeast Expressway/Third Harbor Tunnel is included. This interchange provides exclusive bus ramps to and from the South Station Transportation Center. These ramps therefore provide direct connections to points south and west of the City as well as to Logan Airport. This interchange also includes ramps to and from the local roadway system, including a ramp from the Third Harbor Tunnel to Herald Street Extension.

On-ramps to the Central Artery northbound will be provided from Essex Street, Atlantic Avenue (two-lane), the Sumner Tunnel, Causeway Street, Storrow Drive, and Leverett Circle; off-ramps from the Central Artery northbound will be provided to the Surface Artery (two-lane), Storrow Drive, and Leverett Circle. In the southbound direction, on-ramps to the Central Artery will be provided from Storrow Drive/Leverett Circle, from the Surface Artery, and from Essex Street; off-ramps from the Central Artery will be provided to Leverett Circle/Storrow Drive, Causeway Street, Callahan Tunnel, and Purchase Street.

Surface roadways are also proposed to be constructed and/or modified in this area as part of this project. Broadway Bridge will be replaced by a new bridge realigned slightly to the north and designated as Herald Street Extension. Herald Street Extension (four lanes, median separated) will extend from Albany Street to Broadway at Dorchester Avenue in South Boston. (Existing Herald Street is to be improved by the City of Boston to match the Herald Street Extension cross-section.) A two-way, four-lane relocated Dorchester Avenue will connect Herald Street Extension with the South Postal Annex, providing driveway access to the Annex and existing (privately-owned) Dorchester Avenue. From that point, relocated Dorchester Avenue will continue as a one-way two-lane northbound roadway, constructed above the northbound Central Artery Tunnel in the Channel, intersecting with Summer Street. Between Summer Street and Congress Street, existing Dorchester Avenue (four-lanes with angle parking), will be reconstructed as a two-way six-lane roadway (with no parking). A ramp from the Central Artery northbound will connect with Herald Street Extension, opposite relocated Dorchester Avenue.

The surface roadways along and crossing under the Central Artery will be rebuilt in their approximate present location, where possible. A surface arterial route connecting Atlantic Avenue (one-way northbound) and Purchase Street (one-way southbound) with Causeway Street is also proposed. English-style U-turns will be provided at Pearl Street to

Atlantic Avenue, and from Atlantic Avenue to Purchase Street and Pearl Street. A one-way eastbound connection from Oliver Street to Atlantic Avenue and to Northern Avenue will also be provided. Other U-turns are also selectively located to allow efficient traffic flow between the northbound and southbound surface arterial.

Nashua Street will be realigned from the Massachusetts Rehabilitation Hospital, passing over the new Storrow Drive ramp terminals, and into Leverett Circle.

Five ventilation buildings have tentatively been proposed in the following areas: South Bay area south of Herald Street Extension; at Northern Avenue; at Atlantic Avenue (just north of High Street); at North Street; and along the rear of the Hoffman Building near North Station (Causeway Street). All ventilation structures are expected to be approximately 100 feet high.

South Boston/Seaport Access Corridor

The Seaport Access tunnel (two-way; four-lane, plus weaving lanes) will interchange with the Massachusetts Turnpike/Central Artery/Southeast Expressway in the South Bay area, crossing the south end of the Fort Point Channel and into South Boston. This tunnel crosses Gillette Company and Boston Wharf Company properties and passes under A Street, Summer Street, B Street, and Viaduct Street to an open one-way (southbound) toll plaza (no toll plaza for northbound travel) in the Commonwealth Flats area (Massport property). From the toll plaza area, the roadway enters a portal and curves towards the north, passing through Economic Development and Industrial Corporation (EDIC) property as it approaches Boston Harbor at the west edge of Boston Marine Industrial Park (BMIP).

The profile of the roadway as it crosses the end of the Fort Point Channel is set so the top of the tunnel structure is near the bottom of the existing Channel.

The following ramps to and from the Seaport Access Tunnel will be provided:

- o Congress Street, with a surface street connection to Northern Avenue;
- o Summer Street; and,
- o Northern Avenue.

The Summer Street and Northern Avenue on-ramps to the southbound tunnel will be toll free, providing free access to this facility by all vehicles including trucks.

Ventilation buildings will be located in the vicinity of A Street; between B Street and Viaduct Street; and at the BMIP

near C Street. A Massachusetts Turnpike Authority administration building will be located in Commonwealth Flats overlooking the toll plaza.

Harbor Crossing/Logan Airport Corridor

After passing to the west of BMIP in South Boston, the Third Harbor Tunnel (two-way, four-lanes) approaches Boston Harbor and crosses directly to the Bird Island Flats area of Logan Airport, passing under the main shipping channels. The profile provides a minimum of 7 feet of clearance below the possible future 45-foot deep main shipping channel.

At Bird Island Flats, the four-lane tunnel continues in a north-east direction, providing tunnel ramps to and from the Airport roadway system, generally south of the East Boston Memorial Stadium, although encroachment into the park is not avoided. A ramp is also provided for northbound traffic to the Airport parking garage. Northbound traffic will continue in a tunnel, merging with a relocated egress roadway to the east of the East Boston Memorial Stadium. This roadway to Route 1A northbound continues, requiring modifications to Route 1A, south of Bennington Street and relocation of the MBTA's Blue Line tracks south of Prescott Street. Modifications to Route 1A southbound are also provided to permit traffic to get to the southbound portion of the Third Harbor Tunnel.

This alternative also proposes significant changes to the Airport's roadway system. The existing Cross Road will be relocated slightly to the south; the Airport access road and relocated egress road will be grade-separated, passing under the Cross Road. The existing egress road will be removed, and direct connections to and from the parking garage will be constructed from Cross Road. A two-way relocated Service Road from the air cargo area near Route 1A will also be provided, intersecting with Cross Road, and thus providing connections to Bird Island Flats. A direct connection to the southbound Third Harbor Tunnel is also provided from relocated Cross Road for traffic exiting the Bird Island Flats development.

A ventilation building will be constructed on Bird Island Flats, where the Third Harbor Tunnel enters Airport property at the pier and bulkhead line of Boston Harbor.

RUSSIA
WHARF
COMPANY

286 Congress Street
Boston, Massachusetts 02210

(617) 482-7066

August 22, 1983

Mr. James A. Walsh
Division Administrator
Federal Highway Administration
Transportation Systems Center
55 Broadway, 10th Floor
Cambridge, Ma. 02142

Mr. Robert J. McDonagh, P. E.
Chief Engineer
Massachusetts Department of Public Works
100 Nashua Street
Room 530
Boston, Ma. 02114

RE: FHWA - MA - EIS - 82-02-DS

Gentlemen:

This letter is to express my support for Alternative 5-A Modified as described in the above referenced document.

I wish to express my strenuous objection to all other alternates for any proposal which would construct a third harbor tunnel other than on the proposed Sea Port Access alignment or without depressing and widening the Central Artery.

To the best of my knowledge, Russia Wharf is the only privately owned property abutting directly on the Fort Point Channel's West Bank which will have the proposed Northbound Depressed Central Artery aligned between its' buildings and the water.

The potential exists for serious dimunition of the value of our property if the proposed construction is at all intrusive on our views, marina, parking facilities or water edge access.

Accordingly, my support of 5A Modified is based on the final design of the Northbound Central Artery tunnel located in the Ft. Point Channel achieving the minimal impacts on the Channel and Russia Wharf implied in the "Channel Preservation Design Refinement" plan which was exhibited to me on August 15, 1983.

-continued-

Sierra Club, New England Chapter, letter dated August

projected passenger ferries all around the harbor, as well as recreational boating and entertainment cruises. The harbor is also the center of commercial marine transportation in the state Fishing and lobstering are very important economically to Massachusetts. In addition, many of these marine activities are historically significant.

It is hoped that the Central Artery project could bring better coordination between the MDC Charles River basin plans and the other development plans in the adjacent area. The Sierra Club requests that disruption in the Leverett Circle area (p.288) be minimized. Pedestrian access and walkways must be a priority in this area, and all modifications which could make the new bridge more attractive and reduce shadows should be implemented.

HISTORIC IMPACTS

The description of the historic aspects of the project were all-inclusive and excellent. There was, however, very little consideration of the impacts of the artery project. Boston is an historic city, not made to accommodate automobiles and trucks. That's what has created the ambiance that makes Boston commercially and financially desirable. That is the quality of life that attracts business. To create easy access for cars - roadways and parking - would destroy the ambiance that has made Boston successful.

For example, Fort Point Channel is eligible for the National Historic Register. It is inviolable, and should not be touched. The highway should be underground at the head of the Channel, and also depressed under Old Dorchester Avenue. These is no convincing need for a New Dorchester Avenue, for locationg a tunnel in the Channel, nor for a new Northern Avenue bridge. All the bridges over the Channel should be put in decent condition so the Channel will be navigable as it always has been historically

As the project area includes some of the oldest sections of Boston, the archeaological findings are going to be impressive and numerous. Advance commitment should be make for preserving these sites and publishing their implications. This material will be tremendously exciting for all citizens of the United States.

CHARLESTOWN

With the depression of the Central Artery there is a most beneficial visual improvement to the connection between Charlestown and the downtown districts of Boston. However, this is created at the expense of worsening the impact on the Charles River water passage and the potential pedestrian walkway on each bank. The width of the bridges with their ramp connections, the clearances underneath the river crossing, the design of the substructure and superstructure of the bridges, and the space between them all need reassessment if the approach to this famous river corridor is to be saved.

Us Department of the Interior, Office of the Secretary, Letter dated August 29, 1983

ul ral Resources

ated in our letter of April 7, 1983, we concur that there are no feasible and prudent natives to the use of land in the Fort Point Channel Historic District should the H A determine that one of the tunnel alternatives is necessary to satisfy the portation needs of the Boston area. We also concur that there are no feasible and ent alternatives to the use of land in the Charles River Basin Historic District, and se of land and properties in the Causeway-North Washington Historic District and he Bullfinch-Triangle Historic District by the proposed Central Artery Depression, hold the FHWA determine that such improvement is necessary.

e concur with your proposed measures to minimize harm to these four historic districts with the proviso that adequate recordation be undertaken for any demolished historic tructures, and that the recommendations of the Massachusetts Historical Commission the Boston Landmarks Commission be included in project planning and evidenced in equent project documentation.

e concur that data recovery and/or protection of data in situ is appropriate for any acted archeological resources that may be discovered in your Phase II survey.

ion 6(f)

reational development at the Charles River Basin Reservation has been assisted ugh the Land and Water Conservation Fund Act (L&WCF), Public Law 88-578, a ram administered by the NPS. Any conversion of park property to a non-park use in Basin may require compliance with the Section 6(f) replacement provisions of the c. Coordination with the NPS and the State Liaison Officer (SLO) should be ertaken to determine the applicability of Section 6(f). The SLO in Massachusetts is es S. Hoyte, Secretary of Environmental Affairs, State Office Building, 100 bridge Street, Boston, MA 02202.

uld any Section 6(f) conversions be involved in this project, the NPS would be willing consider a request for such conversion upon submission by the SLO. Any conversion sideration under Section 6(f) first requires Section 4(f) approval of the project by WA. In addition, the conversion must be in accord with the State's comprehensive door recreation plan, and appropriate replacement land of at least equal fair market ue and of reasonably equivalent usefulness and location must be provided.

VIRONMENTAL STATEMENT COMMENTS

e comments provided in our letter of April 7, 1983, on the draft statement, with regard the environmental impacts of tunnel fabrication sites and sites for disposal of cavated material[1/], are still applicable to the present supplemental draft statement. note, however, your firm commitment that further environmental analysis and

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Excavated material means (a) the "muck" which would be excavated from the harbor or for the Third Harbor Tunnel trench and (b) the overburden which would be removed the I-90/Central Artery Depression.

The Boston Preservation Alliance

An Association of Preservation Organizations

P.O. Box 1165, Boston, Massachusetts 02103 Phone: 617-242-5656

August 9, 1983

Mr. James A. Walsh
Division Administrator
Federal Highway Administration
Transportation Systems Center
55 Broadway, 10th Floor
Cambridge, MA 02142

Dear Mr. Walsh:

The Boston Preservation Alliance welcomes the opportunity to comment on the Environmental Impact statement and its supplement for the Third Harbor Tunnell, Interstate 90/Central Artery, Interstate 93. As a coalition of thirty-one preservation groups and historical societies in the City of Boston, the Alliance has deep concern for issues such as this that affect the built environment and the well being of Boston's citizens. The Alliance appreciates the scope of this project whose objective will undoubtedly resul[illegible] in better transportation for the city and the region.

However, the Alliance opposes certain aspects of this project which wil[illegible] have a negative impact on historic resources in the central city and beyond. The first of these is the way in which the Fort Point Channel will be affect[illegible]. A historic body of water (and potentially eligible for the National Register of Historic Places), the Fort Point Channel is the last remaining body of wa[illegible] that defines the old Shawmut Peninsula. The Channel will be severely compro[illegible]mised unless modifications to this project are made. The only alternative t[illegible] the Preservation Alliance sould support with modifications would be number 5A. The other alternatives diminish the Channel drastically because of the introduction of ramps and roadways on the surface. The Alliance opposes th[illegible] extent to which the bulkhead of the new Dorchester Avenue projects into the Channel under alternative 5A and feels that the bulkhead should be diminishe[illegible] to the minimum. The Alliance would also like to see the roadways at the hea[illegible] of the Channel made entirely inconspicuous. Associated with this proje[illegible] is the building of a fixed span bridge to replace the current Northern Ave bridge. The headway of this bridge will be too low to allow sailboats [illegible] through. The Alliance believes that this will have a negative impact on [illegible] Channel as a recreational facility.

Second, the Alliance is concerned about the traffic impact on [illegible] on the South End during and after construction. The Alliance [illegible] Herald Street should be widened in order to help [illegible] vehicles predicted to pass through this National Register district, [illegible] also the largest Victorian residential neighborhood in [illegible].

EXHIBIT E

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

MICHAEL S. DUKAKIS
GOVERNOR

JAMES S. HOYTE
SECRETARY

April 12, 1984

Robert J. McDonagh
Chief Engineer
Executive Office of Transportation
and Construction
Department of Public Works
100 Nashua Street
Boston, MA 02204

Re: L&WCF Project# 25-00099, Charles River Tennis Courts - Central Artery 6(f)(3) Review

Dear Mr. McDonagh:

This office has received the enclosed correspondence from the National Park Service relative to the referenced project and the Central Artery proposal.

We have reviewed the enclosed response from the National Park Service and subsequently concur with their opinion.

Sincerely,

for James S. Hoyte
Secretary

JSH:DFS:rhl

United States Department of the Interior

NATIONAL PARK SERVICE

MID-ATLANTIC REGION
143 SOUTH THIRD STREET
PHILADELPHIA, PA. 19106

PLY :FER TO:

RECEIVED
APR 9 1984
DI... CONSERVATION SERVICES

APR 1984

Mr. Joel Lerner
Executive Office of Environmental Affairs
100 Cambridge St.
Boston, MA 02202

Subject: L&WCF Project #25-00099, Charles River Tennis Courts - Central Artery 6(f)(3) Review

Dear Joel:

We have reviewed our files as well as the supplemental materials recently provided regarding the transportation proposal and the dedicated park area at the Charles River project site. We note the following:

1) The proposed Preferred Alternative will only have a short term temporary effect on the park (during actual construction)
2) The construction will not impact the major developed recreation facilities nor recreator use of them
3) The current alignment of the Preferred Alternative provides for the maintenance of recreator/pedestrian access during project construction
4) The highway revisions, if approved, will clearly serve a public purpose (in contrast to the private proposal regarding #25-00221, Charlestown Waterfront Park)
5) Precautions will be taken to adequately protect the public during the project
6) Given the Preferred Alternative, there would be no permanent loss of dedicated park area which will be restored and returned to full use following construction
7) Your staff are located in close proximity to the project and will be able to monitor it regularly.

We therefore provisionally find no conversion. We emphasize this is only an interim opinion. Any final opinion must await final project routing and completion of the 4(f) review and determination.

Sincerely,

Christine McCoy

Christine McCoy
Chief, Planning & Grants Assistance

Year of the Visitor

NOV 10 '83

L7619 (MAR-PD)

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NOV 1 7 1983

Mr. Robert J. McDonagh
Chief Engineer
Commonwealth of Massachusetts
Executive Office of Transportation
and Construction
Department of Public Works
100 Nashua Street
Boston, Massachusetts 02114

Dear Mr. McDonagh:

This is in response to your letter of October 16, 1983, pertaining to the Section 4(f) Evaluation from the Preliminary Final Environmental Impact Statement/Report for the Third Harbor Tunnel, Interstate 90/ Central Artery, Interstate 93, Boston. As you are aware, the National Park Service (NPS) is responsible for any construction permits issued at the East Boston Memorial Stadium as it has been assisted through the Urban Park and Recreation Recovery Act of 1978, a program administyred by NPS.

The draft report adequately addresses the extent and nature of the impacts on the East Boston Recreation Center. We are pleased that there is no permanent conversion of parkland involved. The mitigation measures, including the replacement land, are satisfactory to this agency. One concern we do have is the provisions for safety measures during the construction period. The design phase of this project should carefully consider safety factors since this park is in both a heavily trafficed area and receives intensive community use.

Thus, NPS is prepared to authorize a construction permit for East Boston Memorial Stadium at the time the Commonwealth of Massachusetts completes the environmental/Section 4(f) impact statement. These comments are provided on a technical assistance basis only and should not be construed as reflecting a position on the project or the environmental/Section 4(f) statement by the Secretary of the Interior. Any formal or official comments on the project by the Department of the Interior are to be initiated through the Office of Environmental Project Review, United States Department of the Interior.

Should you have further questions on impacts at the East Boston Recreation Center, please contact Joseph Karban, Chief, Environmental Quality Division (215-597-2785).

We appreciate your cooperation in this matter.

Sincerely,

ANTHONY M. CORBISIERO
Anthony M. Corbisiero
Associate Regional Director
Planning and Development

cc: WASO 762

BBECKER:jy:11/7/83
General
Daily
Area
Project File

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

100 Cambridge Street
Boston, Massachusetts 02202

MICHAEL S. DUKAKIS
GOVERNOR

JAMES S. HOYTE
SECRETARY

October 26, 1983

FEB 13 1984

James S. Coleman, Jr.
Regional Director
National Park Service
600 Arch Street
Philadelphia, PA 19106

Dear Director Coleman:

Re: Projects# 25-00099
<u>UPARR #25CTY 0120-83-08, 4(f)Evaluat</u>

In accordance with the attached Massachusetts Department o Public Works request, this office is seeking your comments and a of the proposed Third Harbor Tunnel, Interstate 90/Central Arte and Interstate 93 projects.

Sincerely,

James S. Hoyte
Secretary

JSH/rhl

✓ cc: Robert J. McDonagh, Chief Engineer

The Commonwealth of Massachusetts
Executive Office of Transportation and Construction
Department of Public Works
100 Nashua Street, Boston 02114

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DIVISION OF CONSERVATION SERVICES

6 October 1983

Mr. Joel Lerner, State Liaison Office
Department of Conservation Services
100 Cambridge Street
Boston, MA 02202

Dear Mr. Lerner:

As per your telephone conversation with Carole Schlessinger of our consultants, HFMW, on 14 September 1983, I am forwarding a copy of the Section 4(f) Evaluation from the preliminary Final Environmental Impact Statement/Report for the Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93 in Boston.

As noted in the Section 4(f) Evaluation, the Charles River Basin Reservation recreation facilities will be affected only on a short-term basis during the construction period. There will be no permanent conversion of recreational property to a non-park use. The construction period right-of-way has been realigned so that the tennis courts are no longer affected. The pedestrian overpass will be braced, rather than removed.

In compliance with Section 6(f) of the Land and Water Conservation Fund Act, we hereby request State Liaison Officer authorization to conduct construction activities at the Charles River Basin Reservation, an L&WCF grant recipient.

I would appreciate your response at your earliest possible convenience, as we are working on a very tight schedule. Our consultants are available to answer any questions for you or your staff. Please feel free to contact Ms. Carole Schlessinger at (617) 423-4440.

Thank you for your cooperation. I look forward to hearing from you.

Sincerely,

Robert J. McDonagh

Robert J. McDonagh
Chief Engineer

Enclosure

DOI

U.S. Department of the Interior

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OCT 19 1983

Mr. James A. Walsh
Division Administrator
Federal Highway Administration
Transportation Systems Center
55 Broadway, 10th Floor
Cambridge, Massachusetts 02142

Dear Mr. Walsh:

This is to supplement the Department of the Interior's previous comments on the supplemental draft environmental/Section 4(f) statement for Third Harbor tunnel, I-90/Central Artery, and I-93, Suffolk County, Massachusetts.

The draft supplemental document and the Departmental letter of August 29, 1983, did not discuss the status of the East Boston Recreation Center, a part of the East Boston Memorial Stadium.

On August 31, 1983, a rehabilitation grant (#25CTY0120-83-08) was approved by the National Park Service, Mid-Atlantic Regional Office (NPS, MARO) through the Urban Park and Recreation Recovery Program (UPARR) to rehabilitate the Joseph Lee Playground, Columbus Park, and the East Boston Recreation Center. The nature of the rehabilitation at the last property includes a running track, turf, drainage, paving, play areas, landscaping, shelter, fencing, and player benches.

Planning for and compliance with the provisions of the Urban Park and Recreation Recovery Act of 1978 should be incorporated into design plans. You should be aware that any conversion at the East Boston Recreation Center would require the approval of the National Park Service (NPS), as delegated by the Secretary of the Interior and subject to fulfillment of the UPARR Section 1010 criteria:

> No property improved or developed with assistance under this title shall, without the approval of the Secretary, be converted to other than public recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the current local park and recreation recovery action program and only upon such conditions as he deems necessary to assure the provision of adequate recreation properties and opportunities of reasonably equivalent location and usefulness.

impacts to the East Boston Recreation Center. Please direct any questions to the Regional Director, Mid-Atlantic Region, National Park Service, 143 South Third Street, Philadelphia, Pennsylvania 19106.

Sincerely,

(sgd) Bruce Blanchard

Bruce Blanchard, Director
Environmental Project Review

cc: Mr. Robert J. McDonagh, P.E.
Chief Engineer
Massachusetts Department of
Public Works
100 Nashua Street, Room 530
Boston, Massachusetts 02114

Mr. James S. Hoyte
Secretary of Environmental Affairs
State Office Building
100 Cambridge Street
Boston, Massachusetts 02202

Mrs. Patricia L. Weslowski
Executive Director
Massachusetts Historical Commission
294 Washington Street
Boston, Massachusetts 02108

Mr. Robert E. Temple
Acting Regional Director
Northeast Region
National Marine Fisheries Service
Fall Building
Gloucester, Massachusetts 01930

Colonel C. B. Sciple
Division Engineer
New England Division
U.S. Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Mr. William Patterson
Regional Environmental Officer
Northeast Region
15 State Street
Boston, Massachusetts 02109

NPS/MARO/BBecker:br 9/20/83

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
55 Broadway - 10th Floor
Cambridge, MA 02142

IN REPLY REFER TO:
HEV-MA

I-90-1(1)0 Third Harbor Tunnel/Central Artery
Section 4(f) Applicability - Pagoda Park

September 27, 1983

Mr. Robert T. Tierney
Commissioner
Department of Public Works
Boston, Massachusetts

Dear Commissioner Tierney:

Based upon the information contained in your letter dated September 21, 1983, we have determined that the Section 4(f) requirements do not apply to Pagoda Park.

Sincerely yours,

James A. Walsh
Division Administrator

By: P. Robinson
Transportation Planner

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COMM. OF PUBLIC WORKS
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OFFICE OF THE
COMMISSIONER

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

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AUG 29 1983

F. S. & T.
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BOSTON

Ja es A. Walsh
ic Administrator
ra Highway Administration
sp tation Systems Center
ro lway, 10th Floor
brIge, Massachusetts 02142

. Walsh:

is in response to the request for the Department of the Interior's comments on the le ental draft environmental/Section 4(f) statement for Third Harbor Tunnel, Central Artery, and I-93, Suffolk County, Massachusetts.

__N 4(f) STATEMENT COMMENTS__

e ional Resources
ted in our letter of April 7, 1983, we concur that there are no feasible and prudent n ives to the use of land from the East Boston Memorial Stadium and Bird Island ark should the Federal Highway Administration (FHWA) determine that one of the e alternatives is necessary to satisfy the transportation needs of the Boston Area. same basis, we also concur that there are no feasible and prudent alternatives to s of land from the Charles River Basin Reservation and Paul Revere Landing Park proposed Central Artery Depression.

ocur with your proposed measures to minimize harm for these four recreation areas w h the proviso that any further recommendations of measures to minimize harm y the Metropolitan District Commission and by the Boston Parks and Recreation ment would be included in project planning and evidenced in subsequent project entation.

d tion, we strongly urge that your response to the second proviso of Section 4(f) a commitment to fully provide for recreational values and amenities in the g-level studies for this complex project. Considering the unusual magnitude and f the proposal, it is our view that a truely unique opportunity exists to develop an nding integrated urban design which includes sympathetic and thoughtful attention estrian usage, aesthetics, recreational, and historical values.

regard, we recommend that State and local recreational and cultural resource sts, as well as appropriate citizen groups, be convened on an ad hoc basis to liately address and to offer definitive recommendations about these matters to the team for incorporation in the Central Artery component of the project. The al Park Service (NPS) of this Department would be pleased to participate in and e technical assistance for this endeavor. In this connection, we would highlight and mend for your consideration that which has been incorporated in the I-66 project in ton, VA and the I-95 project in Philadelphia, PA.

Cultural Resources
As stated in our letter of April 7, 1983, we concur that there are no feasible and prudent alternatives to the use of land in the Fort Point Channel Historic District should the FHWA determine that one of the tunnel alternatives is necessary to satisfy the transportation needs of the Boston area. We also concur that there are no feasible and prudent alternatives to the use of land in the Charles River Basin Historic District, and the use of land and properties in the Causeway-North Washington Historic District and the Bulfinch-Triangle Historic District by the proposed Central Artery Depression, should the FHWA determine that such improvement is necessary.

We concur with your proposed measures to minimize harm to these four historic districts but with the proviso that adequate recordation be undertaken for any demolished historic structures, and that the recommendations of the Massachusetts Historical Commission and the Boston Landmarks Commission be included in project planning and evidenced in subsequent project documentation.

We concur that data recovery and/or protection of data in situ is appropriate for any impacted archeological resources that may be discovered in your Phase II survey.

Section 6(f)
Recreational development at the Charles River Basin Reservation has been assisted through the Land and Water Conservation Fund Act (L&WCF), Public Law 88-578, a program administered by the NPS. Any conversion of park property to a non-park use in the Basin may require compliance with the Section 6(f) replacement provisions of the Act. Coordination with the NPS and the State Liaison Officer (SLO) should be undertaken to determine the applicability of Section 6(f). The SLO in Massachusetts is James S. Hoyte, Secretary of Environmental Affairs, State Office Building, 100 Cambridge Street, Boston, MA 02202.

Should any Section 6(f) conversions be involved in this project, the NPS would be willing to consider a request for such conversion upon submission by the SLO. Any conversion consideration under Section 6(f) first requires Section 4(f) approval of the project by FHWA. In addition, the conversion must be in accord with the State's comprehensive outdoor recreation plan, and appropriate replacement land of at least equal fair market value and of reasonably equivalent usefulness and location must be provided.

ENVIRONMENTAL STATEMENT COMMENTS

The comments provided in our letter of April 7, 1983, on the draft statement, with regard to the environmental impacts of tunnel fabrication sites and sites for disposal of excavated material[1/], are still applicable to the present supplemental draft statement. We note, however, your firm commitment that further environmental analysis and

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1/ Excavated material means (a) the "muck" which would be excavated from the harbor floor for the Third Harbor Tunnel trench and (b) the overburden which would be removed for the I-90/Central Artery Depression.

eration about these two project-related matters will be undertaken as project progresses. Although we recommended that these matters be thoroughly discussed nal environmental statement for this project, we are cognizant that such is are first contingent upon a decision that each component of the total se project will, in fact, be implemented and then upon a determination of the ion techniques that will be employed for the tunnel element (concrete, steel, Therefore, we are willing to agree to such discussions in a "design-level" ent to the final statement. We urge that such a supplement to the final it be developed as soon as possible to avoid future project delays during required eviews and that an early "Notice of Intent" be given by you when this activity mence.

s of excavated material from the depression and widening of the Central Artery be carefully planned. Use of this clay material to cap landfills provides an ity for beneficial use. However, since many landfill areas are former wetlands, e likely to be adjacent to and in close proximity to existing wetlands. Any n should be done in a manner to avoid any encroachment or further degradation to lands, and appropriate techniques to effect this should be included in project . We also urge that similar upland beneficial use of dredged material be developed l construction is approved.

al impacts to anadromous fish also need further discussion if an alternative ng the Charles River is selected. Restrictions for construction activities during ring spawning runs should be incorporated in project plans, per the mendations of the Massachusetts Department of Fisheries and Wildlife, the cal Marine Fisheries Service and the U.S. Fish and Wildlife Service.

AND WILDLIFE COORDINATION ACT COMMENTS

G on page xvii of the document identifies several types of Federal s/approvals for project work in waters/wetlands. The U.S. Fish and Wildlife e (FWS) has a consultative involvement under the Fish and Wildlife Coordination r these actions.

neither the draft environmental statement nor the present draft supplement ately discuss impacts related to possible tunnel fabrication sites and sites for the al of excavated material, and since it is unlikely that the final statement will do so easons recognized earlier, additional site-specific assessments and environmental ws will be necessary before proceeding on those aspects of the project for which its are needed. We urge that such site-specific work be undertaken as soon as ble.

normal practice, under your "one-stop" review process, for the FWS to provide an indication of its probable position and recommendations in forthcoming permit ews. Insufficient information precludes FWS to do so at this time. However, the advises that it will most likely object to any project-related dredge and fill ities and use of wetlands unless all significant avoidable adverse impacts are ded and adequate mitigation is included in project plans to fully compensate for oidable impacts. The FWS also advises that it stands ready to cooperate and

coordinate with you, Massachusetts Department of Public Works, the Corps of Engineers, appropriate State and local agencies and other involved parties in the evaluation and planning work for these facets of the project.

SUMMARY COMMENTS

The Department of the Interior has no objection to Section 4(f) approval of the Third Harbor Tunnel, I-90/Central Artery, I-93 project, provided the measures to minimize harm discussed above for the use of the 4(f) areas are adequately addressed in subsequent project documentation and included in project plans.

Both the draft environmental statement and the present draft supplement are inadequate in their discussion of environmental impacts related to specific tunnel fabrication sites and sites for excavated material disposal. As presently proposed, these aspects of the project are environmentally unsatisfactory.

We note your commitment that further site-specific assessments and environmental studies for this work will be undertaken and addressed in a "design-level" supplement to the final environmental statement for this project. We agree to this procedure, but at the same time, would alert you that unless the above issues are satisfactorily resolved prior to release of the final version of such a supplement, there is a high probability that we would refer those aspects of the project to the Council on Environmental Quality in accordance with the Council's regulations.

As this Department has a continuing interest in this project, we would be pleased to work with you and to provide technical assistance in your subsequent planning for the project. For questions relating to recreational and cultural matters, please contact the Regional Director, Mid-Atlantic Region, National Park Service, 143 South Third Street, Philadelphia, PA 19106, (phone FTS 597-7013, comm. 215/597-7013). For matters pertaining to fish and wildlife resources, please contact the Field Supervisor, U.S. Fish and Wildlife Service, P.O. Box 1518, 55 Pleasant Street, Concord, New Hampshire 03301 (phone: FTS 834-4797, comm. 603/224-2585).

We appreciate the opportunity to provide these comments.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

cc: (next page)

Ir. Robert J. McDonagh, P.E.
hief Engineer
IA Department of Public Works
00 Nashua Street, Room 530
oston, MA 02114

Mr. James S. Hoyte
Secretary of Environmental Affairs
State Office Building
100 Cambridge Street
Boston, MA 02202

Mrs. Patricia L. Weslowski
Executive Director
MA Historical Commission
294 Washington Street
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Mr. Robert E. Temple
Acting Regional Director, Northeast Region
National Marine Fisheries Service
Fall Bldg
Gloucester, MA 01930

Colonel C. B. Sciple
Division Engineer, New England Division
U.S. Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

Division of Conservation Services

Leverett Saltonstall Building

100 Cambridge Street, Boston 02202

August 23, 1983

NORTH ATLANTIC
29 AUG 1983
DIRECTOR
DEPUTY DIRECTOR
TO
LANDS
PUBLIC AFFAIRS
URBAN AFFAIRS
ARD ADMIN
Contracts
Finance
Personnel
Program
ARD. OPERATIONS
ARD. PLANNING

Robert J. McDonagh
Chief Engineer
Executive Office of Transportation & Construction
Department of Public Works
100 Nashua Street
Boston, MA 02114

Dear Mr. McDonagh:

Thank you for the opportunity to comment upon the 4(f) stateme[nt] from the Supplemental Draft Environmental Impact Statement/Report for the Third Harbor Island, Interstate 90/Central Artery, Interst[ate] 93 in Boston.

As far as I can determine this office has 6(f) concerns over t[he] M.D.C.'s Charles River Tennis Courts, project#25-00099 located in [the] Charles River Basin Reservation. Funds for rehabilitating the are[a] were granted, through this office, to the M.D.C. from the National Park Service Land and Water Conservation Fund Program.

Although difficult to judge impact, if any, Jeffries Point Pa[rk] project #25-00161 also received National Park Service funding. In this case the City of Boston received the financial assistance.

Finally, you should also be advised that the National Park Se[rvice] and the Commonwealth have just committed in excess of $1.3 million for the restoration of Lee Playground, Colombia Playground ~~of~~ the East Boston Recreation Center. Funding for the renovations comes from the federal and state Urban Park And Recreation Recovery (U.P... programs (P.L.95-625 and M.G.L. c.132, S.11E) and work is schedule[d] to start this Fall. Alternatives 3A and 5A involving the Third Ha[rbor] Tunnel would impact the latter UPARR project site.

Please contact me if I can be of further assistance.

Sincerely,

Joel A. Lerner

Joel A. Lerner
Director

cc - UPARR with letter

JAL/rhl

cc: National Park Service

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August 22, 1983

Robert T. Tierney, Commissioner
Department of Public Works
Commonwealth of Massachusetts
100 Nashua Street
Boston, MA 02114

Dear Commissioner Tierney:

Thank you for the opportunity to comment on the draft Environmental Impact Statement on the Central Artery/Third Harbor Tunnel project.

The Boston Landmarks Commission is sympathetic to the goals of this project and commends the Secretary of Transportation and the project team for exploring alternatives which would attempt to minimize disruption of the Central Business District and residential neighborhoods while upgrading the regional transportation system.

The Landmarks Commission, as the City of Boston's agency concerned with the preservation and enhancement of the city's historic resources, has reviewed the draft EIS/EIR including the suplemental report dated June, 1983, in order to assess the potential impacts on the historic resources of the City.

The overriding concern which has emerged from this review pertains to the potentially devastating impact of the "build" alternatives on the Fort Point Channel.

The channel is the last remnant of the water body that defined the old Shawmut Peninsula. With the gradual filling in of the South Bay, a process which would continue under this project, the channel becomes even more important as a vestige of that feature which gave form to the city. The channel, its bridges and the older commercial buildings flanking the channel have been identified as a district potentially eligible for listing in the National Register of Historic Place. While the channel has, for many years, been neglected, it nonetheless represents an important visual and recreational resource for the City, as well as a link with its past.

In general, the Boston Landmarks Commission opposes the use of the channel for roadway purposes - whether for the Third Harbor Crossing, the Central Artery or for Dorchester Avenue. The Commission's specific concerns regarding the channel, are as follows (in rough order of priority:

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1. Reduction in the absolute and visual dimensions of the channel by construction which narrows, shortens or spans it. (Narrowing and spanning activities being more objectionable than shortening its length.)

2. Intrusion of street level traffic between the channel and the headland.

3. Reconstruction of historic bridges resulting in loss of original fabric as well as disruption of symmetry in design when reconstructed.

4. Removal, replacement or visually obscuring the historic bulkhead.

5. Removal of the Old Colony Bridge.

6. Taking of buildings in the South Boston Industrial area.

7. Installation of Vent buildings in the channel near the existing Northern Avenue Bridge.

Of the "build" alternatives currently under consideration, Alternative 5a is the least disruptive with respect to the Fort Point Channel. Alternatives 3, 3a, and 5 are the most objectionable.

The Commission is disturbed to see the re-introduction of a new Dorchester Avenue connection in Alternative 5a modified. It seems particularly unfortunate that, if this connection is important, it must be re-established outside of the old alignment and the old bulkhead.

The Boston Landmarks Commission has no objection per se to the concept of a third harbor crossing, seaport access road or depression of the Central Artery. There are many and varied benefits to be accrued by these projects However, the Commission must state its opposition to the aspects of these projects which would adversely affect the Fort Point Channel and other historic resources, unless these negative impacts can be reduced or mitigated. The Commission would like to see the following:

1. Adoption by the Mass. D.P.W. and Federal Highway of design solutions which would minimize the narrowing or shortening of the channel. Such solutions would include use of part or all of the old Dorchester Avenue alignment or Atlantic Avenue for northbound artery traffic.

2. Elimination of ramps crossing the channel.

3. Elimnation of a new Dorchester Avenue conncection.

4. Public access, appropriate landscaping and provision of water related activities along the channel edge.

5. Mitigation of the negative impacts by positive actions aimed at improving the environment of the channel. Such measures might include facilities to improve water quality in the channel and redesign of the Northern Avenue bridge to allow full access by pleasure crafts and working boats.

6. A process for continued review of more detailed plans for the treatment of the channel, its bridges and bulkhead.

With respect to impacts on resources other than the Fort Point Channel the Commission would like to see: (Alternatives 3a, 5a, & 6)

1. A process for anticipating and monitoring construction impacts on historic resources adjacent to the Central Artery, and a plan for shoring and stabilizing such properties in the event of anticipated or unanticipated damage.

2. A process for continued review of the location and design of vent buildings, new highway ramps and new surface streets adjacent to historic properties and other development on parcels to be created. This can be handled through the Advisory Council procedures established pursuant to Section 106 of the Historic Preservation Act of 1966.

While the draft EIS/EIR does not adequately evaluate the effects of the project on archaelogical resources, it is the understanding of this office that a field investigation of the preferred alternative will be undertaken this fall and that the Advisory Council procedures for protection of historic and cultural properties will be followed.

We look forward to continued discussions with the Executive Office of Transportation concerning this project and measures to reduce its negative impacts on the city's historic resources.

Sincerely,

Marcia Myers

Marcia Myers
Executive Director
Boston Landmarks Commission

cc: Secretary James S.Hoyte
Exec. Office of Environmental Affairs
100 Nashua Street
Boston, MA 02202

The Commonwealth of Massachusetts
Metropolitan District Commission
20 Somerset Street, Boston 02108

WILLIAM J. GEARY
COMMISSIONER

August 15, 1983

Mr. James A. Walsh
Division Administrator
Federal Highway Administration
55 Broadway
Cambridge, Massachusetts 02142

Dear Mr. Walsh:

The Metropolitan District Commission is the agency with the primary responsibility for the police and emergency services on the Central Artery; the management of traffic on nearby parkways; the preservation and enhancement of the parklands Charles River Basin Historic District; and the water quality, recreational and navigational use and flood management of the Charles River. With these responsibilities the agency is directly impacted by the proposed projects.

It is the Metropolitan District Commission's opinion that a depressed and widened Central Artery and new tunnel will provide the citizens of this city and this region with a safer and more efficient highway system. The Central Artery now experiences 2½ times the national accident rate for urban highways. In 1981 Metropolitan District Commission Statistics indicated a total of 682 accidents in the area from the City Square on-ramp through the Dewey Square Tunnel; 1982 resulted in similiar statistics. Ninety percent of these accidents involved personal injury.

The congestion and outdated design of this short stretch of road are the reasons for the alarming number of accidents. The many access ramps merge on to a highway that has inadequate deceleration and acceleration lanes and no breakdown lanes. It is our judgement that mere reconstruction of the artery will not remove the causes of the many accidents.

Construction of the tunnel and depression of the artery create a once-in-a-generation opportunity to significantly improve the quality of life for metropolitan Boston residents. Our challenge is to maximize that opportunity. The following comments are directed to that end.

I. WATER QUALITY

Section 4.9 raises some serious questions concerning drainage. M.D.C. rules and regulations prohibit storm drain connections into sanitary sewers. A connection to an existing combined sewer is allowed, but is subject to pretreatment requirements. The removals of heavy metals and and sediments in Table 97 appear low. Further discussion

'f pretreatment approaches should be presented.

Apparently construction in the Charles River will be behind sheet :teel refraining walls. The effect of this approach on the Dam, locks and asin water quality should be more fully discussed as it relates to the onstruction of the two new bridges as well as for the construction of the entral Artery to Storrow Drive connection.

. CONSTRUCTION PHASING

It is difficult to clearly understand construction phasing and eviation for specific segments of the project. Clarification of timing needed for the construction of the Central Artery to Storrow Drive connection, nd the two new bridges.

II. TRAFFIC

It is stated (p. 170) that ramp connections between I-93 and everett Circle will be unavailable for one year. A brief description f detour routes for this extremely heavy traffic movement should be resented.

New rerouting of Charles Street traffic has changed volumes nd congestion on Storrow Drive between Arlington Street and Leverett ircle. Was this included in the traffic assignment network and does it ffect the Storrow Drive on-ramp volumes (p. 139) and queueing pp. 147-149)?

The Storrow Drive/Leverett Circle connecting ramp construction stated to have major impacts for a two year period (p. 164) mitigating easures and full description of alternative routes and impacts should e presented. The impact on the Craigie Bridge (Charles River Dam) of particular concern.

/. NOISE (LONG TERM EFFECTS)

No noise abatement proposals are made for the Charles River Dam ark. It is unclear from the text if any are proposed. If proposals exist ney should be described; if not the impacts should be more fully desibed.

The effects of pile driving for new bridge piers (both noise and ibration) on the Charles River Dam and Park should be presented pp. 236-237).

. FLOODPLAIN

Apparently the Charles River will be filled in by .7 acre. This fill, s location, effect, construction techniques, finished embankment desiptions etc. should be clearly described. Final elevations and riverank configuration are particularly important.

VI. PEDESTRIAN CIRCULATION

Pedestrian access to Charles River Dam was a major design objective in its construction. Mitigating measures (p. 194) do not address the need to preserve this pedestrian connection to the Dam. Police vehicles must also have constant access as the Dam is the station for the MDC Police Harbor Patrol.

Pedestrians must also have constant access to Science Park Station. In the absence of the pedestrian bridge at Leverett Circle, how will this station function for Museum of Science, Hospitals etc?

VII. CHARLES RIVER DAM

The impacts on the Charles River Dam are significant. The Commission recgonizes the challenge of the design problem and acknowledges that some impact is inevitable. However 15' or less of clearance under twelve lanes of high volume traffic, in addition to the 40,000 square feet of land with less than 8' of clearance requires extensive, detailed, and innovative design measures to mitigate the current proposal. Such measures should be possible to develop. In the design phase of the project the Commission has a major park improvement plan for the Basin extension and the thoughtful incorporation of this plan into the construction program would be appropriate. Alternatives to the truss bridge design and to the spacing of the two bridge structures should be fully explored. The view from the Dam for the operators, police and recreational users must be considered. The Commission is anxious to work closely with the Department to develop a comprehensive program for impact mitigation in this area.

VIII. FACTUAL ERROR

The boundry of the National Register District does include Storrow Drive and Leverett Circle (p. 292). The review process for National Register properties should be described.

The Commission appreciates the opportunity to comment on this EIS/EIR. And is confident that it can work closely with the Department of Public Works and EOTC on the aforementioned issues. The proposal project is vital and we believe can be designed to be a lasting benefit to the use and enjoyment of the areas to be impacted by its construction.

Sincerely,

William J. Geary
Commissioner

WJG:cao

THE COMMONWEALTH OF MASSACHUSETTS

METROPOLITAN DISTRICT COMMISSION
20 SOMERSET STREET, BOSTON 02108

PUBLIC INFORMATION OFFICE
727-5215

CONTACT: Cheryl Yaffe
727-5215

FOR IMMEDIATE RELEASE
9 August 1983

METROPOLITAN DISTRICT COMMISSIONER WILLIAM J. GEARY TODAY TESTIFIED IN SUPPORT OF THE DEPRESSION OF THE CENTRAL ARTERY AND THE THIRD HARBOR TUNNEL

Metropolitan District Commissioner William J. Geary today testified in strong support of the depression of the Central Artery and the third harbor crossing. The Metropolitan District Commission is the agency with the primary responsibility for police and emergency services on the Central Artery, as well as the agency responsible for the preservation, protection and enhancement of the region's parks and open spaces. Commissioner Geary focused on the issues of public safety and environmental improvement.

The Central Artery is Boston's major North - South Connector as well as a major route to Logan Airport. It is the region's most important transportation facility and the region's number one traffic congestion problem. At present the Artery is far exceeding its capacity, with 160,000 cars per day using the road and traffic projections of a ten percent increase over the next twenty years. This aging and overburdened structure will have to be rebuilt or replaced within the next ten years in order to keep the route operational.

- more -

The Central Artery now experiences 2½ times the national accident rate for urban highways. In 1981 Metropolitan District Commission Statistics indicated a total of 682 accidents in the area from the City Square on-ramp through the Dewey Square Tunnel; 1982 resulted in similar statistics. Ninety percent of these accidents involved personal injury.

The enormous congestion and hazardous design of this short stretch of road is the reason for the alarming amount of accidents. The many access ramps merge on to a highway that has inadequate deceleration and acceleration lanes and no breakdown lanes.

Commissioner Geary explained the role of the Metropolitan District Commission Division of Central Services, which provides motorist aid, emergency services and unique capabilities to handle critical accident situations. The Commissioner showed dramatic photographs of serious truck accidents along the Artery responded to by Metropolitan Police and the Metropolitan District Commission Central Services Special Emergency Operations Unit. He estimated that this unit responds to similar accidents on this stretch of road 55 times a year. Also, the Division's Motorist Aid Patrol, which operates daily, assists thousands of disabled vehicles per year.

The public safety concerns when the Central Artery is jammed from 6 a.m. to 8 p.m. as projected in the Environmental Impact Statement is startling. As it is now, there is grave concern in this city for the ability of emergency vehicles to get through city streets.

Commissioner Geary stated, "It is the Metropolitan District Commission's opinion that a depressed and widened Central Artery will provide the citizens of this city and this region with a safer and more efficient highway system. As the agency responsible for policing the Central Artery during construction, it is our judgement that mere reconstruction of the artery will not remove the causes of the many accidents."

Commissioner Geary emphasized that one of his agency's strongest mandates is to preserve, enhance and develop the urban park characteristics within the Metropolitan area.

The depression of the Central Artery will eliminate the horrendous elevated structure which for years has been the dark cloud over Boston's streets as well as an obstruction to the city's historic waterfront area. The Metropolitan District Commission will be working in cooperation with the Department of Public Works on design improvement for the proposed twin bridges over the Charles River Dam.

Commissioner Geary said, "In conclusion, it is my hope that the Metropolitan District Commission can work with state and federal agencies to not only provide the region with a safer transportation system. but also improve and enhance the environment and liveability of the city."

###

Boston

August 9,1983

Mr. Robert T. Tierney
Commissioner
Department ; Public Works
100 Nashua Street
Boston, Massachusetts 02114

Dear Commissioner Tierney:

In review of the proposal for the Third Harbor Tunnel, the East Boston Recreation Center, which is the largest outdoor multi-use recreation area for the East Boston Community, will be affected in several of the plan versions. The East Boston Recreation Center is located adjacent to Airport property on Porter Street and is owned and operated by the Boston Parks and Recreation Department. It is essential that this recreation facility not be adversely affected or altered due to the construction of the Third Harbor Tunnel. Because of the variety of recreation activities offered at the East Boston Recreation Center and because of the transportation difficulties involved in leaving East Boston for recreation, the East Boston Recreation Center is the single most important neighborhood recreation facility within walking, bicycling or public transit distance to East Boston residents.

Specifically, in the Alternative 5A Modified which seems to have wide community support, the AP-3 Ramp appears to be constructed under the southeast portion of the East Boston Recreation Center. This area of the facility provides basketball and tennis courts for community use. If there were to be underground construction in this area, we would require that these courts and perimeter area be completely reconstructed, that the interruption of facility use be as limted as possible, that a construction schedule be closely followed and that the adverse affect of noise and dust during construction be mitigated to the greatest extent possible so as not to effect park users in other areas of the facility.

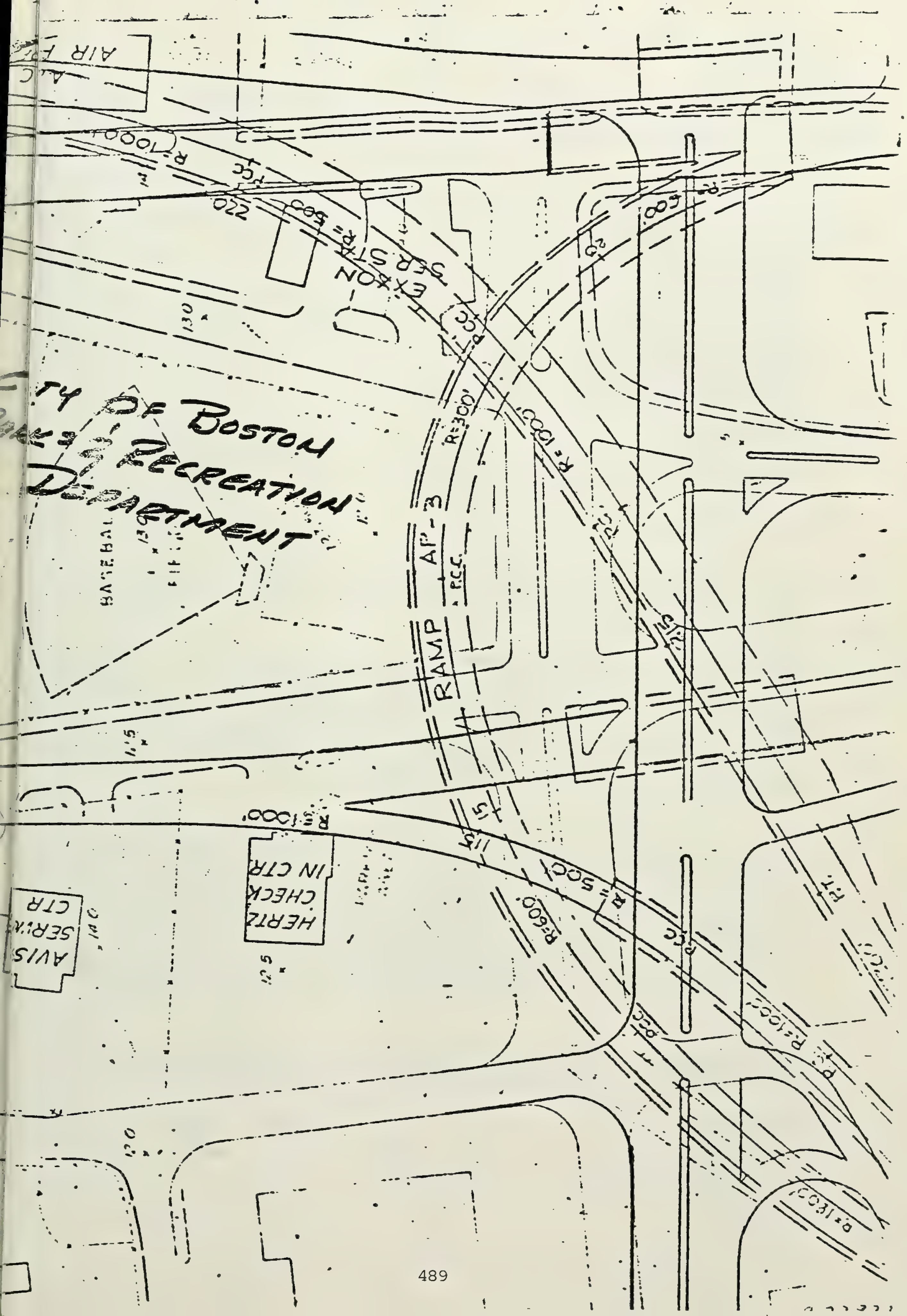
The East Boston Recreation Center is an important open space resource to the community and I welcome the opportunity to work with you in the Third Harbor Tunnel project in order to preserve this recreation facility as your project progresses.

Sincerely,

Robert R. McCoy

Robert R. McCoy
Commissioner

Kevin H. White, Mayor/PARKS AND RECREATION DEPARTMENT/Boston City Hall/City Hall Plaza 02


TY OF BOSTON
RECREATION
DEPARTMENT
RAMP AP-3
R=300'
P.C.C.
BASEBALL
R=1000'
R=500'
P.C.C.
130
125
120
115
HERTZ CHECK IN CTR
AVIS SERVICE CTR
EXXON SER STA

Advisory
Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

AUG 1 1983

Mr. James A. Walsh
Division Administrator
Federal Highway Administration
Transportation Systems Center
55 Broadway, 10th Floor
Cambridge, MA 02142

REF: Third Harbor Tunnel, Interstate 90 and Central Artery, Interstate 93, Boston, Massachusetts

Dear Mr. Walsh:

The Massachusetts Department of Public Works (MDPW) has provided us with a copy of the Supplemental Draft Environmental Impact Statement/Report for the referenced project.

The Supplemental DEIS identifies adverse and other possible effects on many historic properties eligible or potentially eligible for the Nationa Register of Historic Places. These properties include Faneuil Hall Marke Long Wharf, and Russia Wharf, and the following Historic Districts: Blackstone Block, Bulfinch Triangle, Charles River Basin, Custom House, Causeway-North Washington Streets, North End, Old Waterfront, Fulton Commercial, and Fort Point Channel/South Boston.

We understand that the Federal Highway Administration and MDPW are curren working with the Massachusetts State Historic Preservation Office to identify historic resources and to make specific findings of effect on historic structures and archeological properties. Thereafter, we note your expressed intention to seek the Council's comments pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended At that time we would appreciate copies of the Historic Resources Report and Archaeolgical Survey Report referenced in the Supplemental DEIS' Tabl of Contents.

In the meantime, we will maintain a file on this project. If you have any questions, please contact Kate M. Perry at FTS 254-3495.

Sincerely,

Don L. Klima
Chief, Eastern Division
of Project Review

Mr. Robert J. McDonaugh, P.E.
Chief Engineer
Massachusetts Department of Public Works
100 Nashua Street
Room 530
Boston, MA 02114

James S. Hoyte
Secretary
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
BOSTON AREA OFFICE
BULFINCH BUILDING, 15 NEW CHARDON STREET
BOSTON, MASSACHUSETTS 02114

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REGION I

IN REPLY REF

AUG 1

Mr. James A. Walsh, Division Administrator
Federal Highway Administration
U.S. Department of Transportation
55 Broadway Street - 10th Floor
Cambridge, Massachusetts 02142

Mr. Robert J. McDonagh, Chief Engineer
Massachusetts Department of Public Works
100 Nashua Street
Boston, Massachusetts 02114

Dear Sirs:

SUBJECT: Supplemental Draft Environmental Impact Statement/Report
for
Boston - Interstate Route 90 - Third Harbor Tunnel
and
Interstate Route 93 - Central Artery

The Department of Housing and Urban Development is making limited observations to assist Boston and the larger metropolitan region in environmental matters with regard to their obligations under HUD assisted Community Development and assisted Housing Programs.

Under the no-build alternative, to include redecking of the Central Artery only, the core roadway system must carry significantly higher volumes of traffic, thereby, creating longer hours of congestion. From the HUD prespective, air and noise quality, in particular, would become progressively worse. With an exacerbation of regional traffic movement community and housing development in the built environment will continue to suffer under the no-build alternative.

Not either of the build alternatives (depressing the Central Artery and constructing a third harbor tunnel in either the existing railroad or airport alignments) would interfere adversely with any of HUD's goals and objectives. Either of the build alternatives should produce improved traffic movement which will have positive impacts on community and housing development in the metropolitan region.

Depressing the Central Artery will greatly improve visual contact downtown, toward the waterfront, and the North End's historic resources; which are much desired attributes of the city's built environment. The final designs must include mitigating measures to minimize unwanted traffic snarls; so that the improved access through the city will have a positive impact on locational housing choices throughout the region.

It would be preferable that tunnel traffic surface on Logan Airport property than in East Boston's residential neighborhoods.

This Office does not object to the proposed treatment of the four publicly-owned recreation areas under either of the build alternatives with respect to the required 4(f) analysis. There does not appear to be any other viable alternative with less of an impact on the East Boston Memorial Stadium, the Bird Island Flats Park, The Paul Revere Landing Park or the Charles River Basin Reservation.

Thank you for the opportunity to comment on the Draft Environmental Impact Statement/Report for the proposed Central Artery improvements, the proposed Third Harbor Tunnel and the effects on publicly-owned recreation areas.

Sincerely,

Carl J. Byers

Carl J. Byers
Environmental Clearance Officer

Boston Area Office, Region I
Bulfinch Building, 15 New Chardon Street
Boston, Massachusetts 02114

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WALLACE, FLOYD, ASS

J. William Oliver
Commonwealth of Massachusetts
Executive Office of Transportation
and Construction
Department of Public Works
100 Nashua Street
Boston, MA 02114

Dear Mr. Oliver:

SUBJECT: Third Harbor Tunnel
Draft EIS/EIR

This is in response to your May 12, 1983 letter regarding the required 4 (f) analysis of the cited study which has been expanded to include three new alternative alignments.

As in our September 30, 1982 letter regarding the East Boston Memorial Stadium and the Bird Island Flats Park; we also find that the Paul Revere Landing Park in Charlestown can be included; and no conflicts to HUD assisted programs and goals will result.

Thank you for the opportunity to comment.

Sincerely,

Carl Byers

Carl J. Byers
Environmental Officer, 1.1CP

cc: Gordon H. Slaney
HFM W-60 First Avenue
Waltham, MA

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 83/162

APR 7 1983

Mr. Norman J. Van Ness
Division Administrator
Federal Highway Administration
Transportation Systems Building
55 Broadway
Cambridge, MA 02142

Dear Mr. Van Ness:

This responds to a request for the Department of the Interior's comments on the draft environmental/Section 4(f) statement for Third Harbor Tunnel Project (I-90 extension from I-93 to East Boston), Suffolk County, Massachusetts.

SECTION 4(f) STATEMENT COMMENTS

We concur that there are no feasible and prudent alternatives to the use of land from the East Boston Memorial Stadium, Bird Island Flats Park, and the Fort Point Channel Historic District, should the Federal Highway Administration determine that one of the build alternatives is necessary to satisfy the transportation needs of the Boston area.

We also concur that the measures to minimize harm addressed in the draft statement are adequate. We especially recommend mitigation of impacts to the Old Colony Railroad Bridge by rebuilding the structure as noted on page 288. The recommendations of the Massachusetts Historical Commission, the Boston Landmarks Commission, and the Boston Parks and Recreation Department, should be incorporated into mitigation design plans, and the results of continuing consultations with these agencies reported in the final statement.

ENVIRONMENTAL STATEMENT COMMENTS

Since the Third Harbor Tunnel Project may ultimately generate increased local traffic loadings, the final statement should address possible future actions that may result from such increases. These actions might include major reconstruction of the Central Artery, new highways connecting the Northshore with East Boston and/or I-90, and new Interstate or expressway links near or in the old I-95 on other corridors.

The proposed Lynn Harbor fabrication site will have far greater impacts to fish and wildlife resources than the proposed tunnel. Although the draft statement gives a qualitative sketch of species found in the area, it does not contain sufficient data to provide an assessment on how the biological productivity of the Lynn Harbor area (including the Pines and Saugus Rivers) will be impacted by the removal of 5 million cubic yards of material from 75 acres of productive shallow water/intertidal habitat. The draft statement also fails to emphasize the importance of the area for waterfowl wintering habitat, especially black duck. The black duck is an important waterfowl

species in the Northeast whose population has been declining. Although all the reasons for this decline have not been identified, the loss of critical wintering habitat is a major factor.

New London, Connecticut and New Haven, Connecticut were identified as other possible fabrication sites for concrete tubes. If steel tubes are eventually chosen over concrete tubes, these could be fabricated at one of several East Coast shipyards. The draft did not identify any specific locations. The New England River Basins Commission's September 1981 Ports and Harbors Study identifies potential environmental constraints for both New London and New Haven. The New London Mills area is some distance from the navigation channel and contains highly valuable fish and wildlife resources which would most likely preclude the development of a fabrication site there. The general problem in New Haven is highly contaminated sediments which will require rigid environmental safeguards in both dredging and spoil disposal. Also the 1981 New England River Basins Commission Study indicated that non-port development was proposed for the United Steel Buildings area in New Haven. This may preclude New Haven as a viable alternative to Lynn.

In our opinion, unacceptable environmental consequences are associated with possible fabrication sites of concrete tubes at Lynn, New London, or New Haven. These sites, as well as additional ones along the Atlantic Coast, should be fully studied and evaluated so that an environmentally acceptable site can be selected, including appropriate mitigation. Study criteria should include avoidance of areas of resource significance, such as waterfowl wintering areas, shellfish beds, fishing grounds, spawning and nursery areas. Avoidance of adverse impacts is much more desirable than trying to replace lost habitat values and implementing appropriate mitigation measures.

Although fabrication sites for steel tube construction were only identified as East Coast shipyards, we assume that deep water would be available and that dredging would not be required. If this is correct, then it would appear that the destruction of 75 acres of shallow water/intertidal habitat can be avoided as well as the disposal of 5 million cubic yards of dredge material. The final statement should fully evaluate all impacts for both concrete and steel tube fabrication sites so that the alternative selection as well as mitigative requirements can be made in a sound environmental manner.

We agree that the Foul Area has been designated and used as a disposal site for dredged material, but the draft statement does not fully reflect the fact that present use of this area is currently being reviewed and reevaluated to determine if existing environmental controls/regulations are adequate or if further refinement is dictated. The Corps of Engineers, in cooperation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, and the Commonwealth of Massachusetts, is monitoring settling and dispersal of polluted dredged material at the Foul Area to determine the effectiveness of capping. Some preliminary data indicate that fine grained non-cohesive materials are dispersed into the Georges Bank environment and not contained at the Foul Area.

The draft statement indicates that, depending on availability of Federal funding, construction could start in late 1986 and would continue for 3 or 4 years depending on which alternative is selected. By 1986, the present criteria for dredging and disposal of polluted sediments could change. The final statement should recognize this possibility and address upland containment for polluted material. In addition, specific provisions for the beneficial use of non-polluted material should be addressed.

The discussions of dredged material disposal alternatives in Appendix 7 is misleading. Discussions are in context of the proposed Corps of Engineers' navigation improvement for Boston Harbor and imply that dredging and spoil disposal for the harbor tunnel will follow established procedures. Comments should be clarified to show that the Corps of Engineers is not currently engaged in further navigation improvements for Boston Harbor. At this time, it is likely that dredging and spoil disposal for the harbor tunnel would be initiated prior to any navigation improvement dredging.

FISH AND WILDLIFE COORDINATION ACT COMMENTS

The draft statement identifies significant Government Actions and non-Federal projects associated directly with tunnel construetion, but does not provide a parallel treatment for Lynn Harbor or other alternative fabricating sites. In order to allow adequate review and evaluation of interrelated Federal and non-Federal actions, the final statement should include this information.

Given the magnitude of the Third Harbor Tunnel Project, we recommend that, prior to the release of the final statement, the project sponsors develop, in coordination with concerned agencies, mitigation plans for the selected and/or preferred alternates that will result in full compensation for all unavoidable adverse impacts. In accordance with CEQ Regulations, Section 1502.14 and 1502.16, these mitigation plans should be clearly identified and documented in the final statement. These mitigation plans should also be included in the Record of Decision under Section 1505.2.

In future interrelated Federal reviews, including permit actions, the U.S. Fish and Wildlife Service advises that it will most likely object to any project related construction unless all significant avoidable adverse impacts have been avoided and that adequate mitigation has been included in project plans to fully compensate for unavoidable impacts. We recommend that you undertake further consultation with the Fish and Wildlife Service prior to developing the final statement.

SUMMARY COMMENTS

The Department of the Interior has no objection to Section 4(f) approval of the Third Harbor Tunnel Project, providing the measures to minimize harm discussed above are adequately addressed in the final statement.

We find, however, that the draft statement is not adequate in its discussion of adverse environmental impacts related to tube fabrication sites and dredged material disposal. As presently proposed, the alternative tube fabrication and dredged material disposal

sites, as well as the management practices associated with these sites, are environmentally unsatisfactory. Unless these issues are satisfactorily resolved prior to release of the final environmental statement, we may refer the proposed project to the Council on Environmental Quality in accordance with Section 1504 of the Council's regulations.

Our bureaus at the field-level would be pleased to work with you, the project sonsors, and all other concerned agencies, to expeditiously resolve the above matters so that such resolution may be included in the final statement. For issues related to fish and wildlife resources, and permit reviews under the Fish and Wildlife Coordination Act, please contact the Field Supervisor, U. S. Fish and Wildlife Service, P.O. Box 1518, Concord, NH 03301 (phone: FTS 834-4797; comm. 603-224-2585). For issues related to parks, recreation areas, and cultural resources, please contact the Regional Director, Mid-Atlantic Region, National Park Service, 143 South Third Street, Philadelphia, PA 19106 (phone: FTS 597-7013; comm. 215-597-7013).

Thank you for the opportubnity to provide these comments.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

cc: Mr. J. William Oliver
Massachusetts Department of Public Works
100 Nashua Street, Room 530
Boston, Massachusetts 02114

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MAR 1 ... 1983

OFFICE OF THE SECRETARY OF
ENVIRONMENTAL AFFAIRS

COMMONWEALTH OF MASSACHUSETTS
Office of the Secretary of State

SACHUSETTS
HISTORICAL
COMMISSION

294 Washington Street
Boston, Massachusetts
02108
617-727-8470

MICHAEL JOSEPH CONNOLLY
Secretary of State

Mrch 14, 1983

Nrman J. Van Ness
Dvision Administrator
FWA
Tansportation Systems Center
5 Broadway, 10tn floor
Cmbridge, MA 02142

R: Third Harbor Tunnel, Interstate Route 90, Draft Environmental Impact Statement
FHWA-MA-EIS-82-02-D

Dar Mr. Van Ness:

Saff of the Massachusetts historical Commission have reviewed the Draft Environmental Ipact Statement/Report for the Tnird Harbor Tunnel project referenced above, in compliance with Section 106 of the National Historic Preservation Act of 1966.

Te DEIS/R adequately documents tne historic resources and archaeological potential of th poject area. All alternatives, with the exception of the no-build alternative, will aversely affect the significant historic resources in the Shawmut Peninsula end of the poject area. however, it is impossible to apply the criteria of effect on archaeologica esources within the proposed project, since the level of documentation provided in the Achaeological Volume of the DEIS/R only identified archaeologically sensitive areas and nt actual sites.

Te industrial structures that line and define the Fort Point Channel and the Channel itself have an integral relationship to one another. The Fort Point Channel and ajacent structures are considered to be eligible for listing in the National Register of Historic Places as an historic district. The importance of the Fort Point Channel distri s a locus of 19th-century transportation development and industrial change is clearly resented in the DEIS/R and Historic Resources Inventory.

n all the alternatives, the Channel, an historically significant man-made feature, will e irretrievably altered by substantially reducing its historic size and configuration. he new tunnel structure, ramps and Dorchester Avenue roadway would introduce new isual elements without historic precedent and isolate the resources from their historic nvironment. The Russia Wharf Buildings would also be directly cut off from water ccess; their relationship to their historic environment would be destroyed and ppreciation and understanding of their historic significance would be seriously ffected. Noise and traffic generated also could introduce uncharacteristic elements n the historic environment. The discussion of mitigation is inadequate. An alternative deleting the new Dorchester Avenue roadways and ramps should be considered in ddition to other alternatives which would avoid the Fort Point Channel.

he archaeological research indicates that a number of project study areas have a trong potential for the presence of significant historic and prehistoric archaeological roperties. However, a locational survey was not conducted. MHC requests that an rchaeological testing program be conducted in the South Cove project area to identify

potentially significant archaeological properties. The results of the survey should be presented in the revised DEIS, in compliance with Advisory Council Procedures (36CFR800). Should additional alternatives be studied, archaeological background research and locational survey should be completed for the new study areas. If you have any questions concerning this review, please contact Brona Simon or Joseph Orfant of MHC staff.

Sincerely,

Valerie Talmage

Valerie Talmage
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: Robert McDonagh, MDPW, Central Artery Section
James S. Hoyte, EOEA, MEPA Unit

VT/sac

Advisory
Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

FEB 28 1983

Mr. Norman J. VanNess
Division Administrator
Federal Highway Administration
Transportation Systems Center
55 Broadway, 10th Floor
Cambridge, MA 02142

Dear Mr. VanNess:

Thank you for providing us with your Draft Environmental Impact Statement (DEIS) for Interstate 90, Third Harbor Tunnel Project. We note that the undertaking will affect properties both included in and eligible for the National Register of Historic Places, identified in Section 3.10.1 of the DEIS.

We are pleased to note the extensive consultation that has taken place with the Massachusetts State Historic Presevation Officer. We look forward to receiving your request for our comments under Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470f), as discussed in Section 4.13.1 of the DEIS.

Thank you for your cooperation. If you have any questions, please contact Kate M. Perry at 202-254-3495.

Sincerely,

Don L. Klima
Chief, Eastern Division
of Project Review

EXHIBIT F

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

COASTAL ZONE
MANAGEMENT

December 1, 1983

r. Robert J. McDonagh, P.E.
hief Engineer
epartment of Public Works
00 Nashua Street
oston, MA 02108

e: Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93

ear Mr. McDonagh:

The Massachusetts Coastal Zone Management (MCZM) Office has received your statement of consistency for the above mentioned project.

Pursuant to Section 307(d) of the Coastal Zone Management Act of 1972, all state and local government activities affecting the coastal zone that are supported by federal financial assistance are subject to "federal consistency review" which is intended to assure that all federally funded projects are consistent with MCZM Program Policies.

Since the Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93 proposal involves an application to the Federal Highway Administration (FHWA) for financial assistance, the MCZM Office has exercised the above mentioned federal consistency review authority.

Having reviewed both the DEIS/R and the supplement to the DEIS/R, this Office concurs that the "concept" of this proposal is consistent with MCZM Program Policies and especially Policy 26 which is intended to insure that investments in transportation improvements guide growth in a manner that is consistent with MCZM objectives.

While this conceptual concurrence allows the DPW to receive federal funding, MCZM will conduct federal consistency review of other federal actions including the issuance of the U.S. Army Corps of Engineers permits under Section 404 and Section 10 that relate to this proposal after the final EIS/R is approved.

Please feel free to contact Marianne Connolly of my staff if you have any questions or need any additional information.

Sincerely,

Richard F. Delaney

Richard F. Delaney
Director

RFD:MC:bam

EXHIBIT G

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
One Winter Street, Boston 02108

HON D. CORTESE, Sc. D.
ommissioner

December 27, 1983

r. Robert J. McDonagh, P.E.
hief Engineer
ssachusetts Department of Public Works
)0 Nashua Street
oom 530
oston, Massachusetts 02114

ear Mr. McDonagh:

ur office recently received the Final Environmental Impact tatement/Report for the Third Harbor Tunnel, Interstate 90/Central rtery, Interstate 93-Boston, Massachusetts, Main Report and Appendix -Air Quality. The Department appreciates the opportunity to review nese documents prior to the release of the final EIS/EIR, in order o identify and resolve any major problems with the air quality nalysis. Based on our review, the documents received contain no ajor problems.

owever, we will defer our consistency determination until we receive he complete EIS/EIR. As you are aware, several issues remain nresolved. These include the location of the tunnel fabrication ite, the air quality implication of traffic detour and routing during he construction period, problems related to DEQE short-term NO_2 olicy, and possible hydrocarbon impacts. Our final EIS comment etter will require future environmental analyses and possible DEQE nvolvement.

f you have any questions please call me.

Very truly yours,

Kenneth A. Hagg

Kenneth A. Hagg
Director

c: James Walsh, FHWA
Matthew Coogan, EOTC
Norman Faramelli, Massport
Samuel Mygatt, MEPA
Thomas Wholley, EPA
Michael Maher, Met. Bos./N.E. Region

LIST OF PREPARERS

The following section briefly describes the responsibilities, qualifications, and titles (at the time of preparation of the FEIS/FEIR) of some of the individuals who were involved in the preparation of the Draft, Supplemental Draft, and Final Environmental Impact Statement/ Environmental Impact Reports for the Third Harbor Tunnel/Central Artery project.

Frank A. Bracaglia, P.E.

Staff Specialist for Environment, Federal Highway Administration (FHWA)

Mr. Bracaglia is a civil engineer and environmental specialist with more than eight years of experience with FHWA. He has worked on portions or supervised the preparation of numerous highway environmental documents. Mr. Bracaglia was responsible for the document's conformancy with Federal requirements. He was also extensively involved in the Federal review and coordination of the environmental documents. He holds a Bachelor of Science degree in civil engineering.

Robert W. Crim, P.E.

Area Engineer, Federal Highway Administration (FHWA)

Mr. Crim is a highway engineer for the FHWA with nearly eight years of experience in highway design and construction. He holds a Masters degree in Civil Engineering and has worked on many highway projects in Massachusetts and other states. Mr. Crim was responsible for the FHWA's review and critique of the engineering aspects of the alternatives included in the environmental documents.

J. William Oliver, P.E.

Supervisor, Central Artery Section, Massachusetts Department of Public Works (MDPW)

Mr. Oliver has 33 years of experience in highway planning and design. He was responsible for supervision and coordination of the environmental documents for the MPDW.

Matthew A. Coogan

Undersecretary of Transportation, Executive Office of Transportation and Construction

Mr. Coogan specializes in transportation planning and community development. For the SDEIS and the FEIS, Mr. Coogan represented EOTC and provided extensive review comments during their preparation. He also was responsible for the policy aspects of the project. Prior to serving at EOTC, Mr. Coogan worked with the Boston Redevelopment Authority as Senior Project Manager for projects including South Station, Fort Point Channel, Downtown Crossing, and Lafayette Place. He holds a Bachelors degree in social psychology and was the recipient of a Loeb Fellowship in Advanced Environmental Sciences.

John L. Gardner, P.E.

Supervising Civil Engineer, Massachusetts Department of Public Works (MDPW)

Mr. Gardner is a transportation and highway design engineer with 33 years of experience at the MDPW. He holds a degree in civil engineering. In the Third Harbor Tunnel/Central Artery study, Mr. Gardner assisted in the review and critique of the documents. He also supervised review of the project's engineering submissions to the Department of Public Works.

Robert M. Horigan, P.E.

Environmental Engineer, Massachusetts Department of Public Works (MDPW)

Mr. Horigan heads the MDPW's Environmental Section. Mr. Horigan has prepared and supervised many environmental documents during the past ten years. For this study, he

was involved in the review of the draft document at the State level.

James Allen, P.E.

Supervising Transportation Planning Engineer, Massachusetts Department of Public Works (MDPW)

Mr. Allen has 34 years of experience in highway engineering and transportation planning and has directed numerous transportation projects for the MDPW involving traffic analysis and traffic forecasting. He holds a Masters degree in Civil Engineering. In this study, Mr. Allen assisted in the supervision of the Central Transportation Planning Staff's efforts in transportation forecasting.

Gordon H. Slaney, P.E.

Project Manager, HFMW - A Joint Venture

Mr. Slaney is a civil engineer and an Associate with Howard Needles Tammen & Bergendoff. He has 17 years of project management, administration, and design experience in environmental and highway projects, including planning, environmental impact analysis, preliminary and final design, and construction. As Project Manager of the current study, Mr. Slaney had overall responsibility for project budgeting, administration, and coordination, and was also responsible for the overall technical quality and content of the environmental document. Mr. Slaney holds a Masters degree in civil engineering.

Rodney P. Plourde, P.E., Ph.D.

Deputy Project Manager - Environmental HFMW - A Joint Venture

An Associate and Vice President with Fay, Spofford & Thorndike, Inc., Mr. Plourde has 15 years of experience in the field of transportation planning and engineering, and has worked on more than 25 environmental impact statements and reports. He holds a doctorate degree in transportation with a minor in city planning. In this study, Mr. Plourde was responsible for the overall content and production of the environmental document and related reports and for directing the traffic studies.

Leonard J. Barbieri, P.E.

Deputy Project Manager - Engineering, HFMW - A Joint Venture

Mr. Barbieri has 27 years of experience evaluating and designing large-scale transportation engineering projects. A Senior Engineer with CE Maguire, Inc., Mr. Barbieri holds a Bachelor of Science degree in industrial technology. As Deputy Project Manager for Engineering, Mr. Barbieri was responsible for directing and coordinating all engineering aspects related to the Third Harbor Tunnel and Central Artery projects, including preparation of engineering-related portions of the environmental document.

Gordon Brigham

Deputy Project Manager - Planning, HFMW - A Joint Venture

Mr. Brigham, a planner with experience in both the public and private sectors, specializes in the management of large-scale development projects. He worked for the City of Boston as Director of the Boston Plan. Currently on the staff of Wallace, Floyd, Associates Inc., Mr. Brigham's responsibilities included coordination of the planning efforts with traffic and engineering disciplines, and supervision of preparation of land use, community facilities, and visual portions of the environmental document.

Adel Foz

Deputy Project Manager - Urban Design, HFWM - A Joint Venture

Mr. Foz, an Associate with Wallace, Floyd, Associates Inc., has extensive experience in highway-related impact studies,

regional impact studies, and urban design and neighborhood planning. Mr. Foz holds advanced degrees in architecture, urban design, and planning. His responsibilities in the present study included coordination of the urban design efforts with traffic and engineering disciplines, and assistance in the supervision of preparation of land use, community facilities and visual portions of the environmental document.

Lydia E. Mercado

Deputy Project Manager - Community Participation, HFMW - A Joint Venture

Ms. Mercado, a planner with Wallace, Floyd, Associates Inc., has extensive experience in designing and implementing community participation programs, including programs for several major transportation projects. Ms. Mercado holds a Masters degree in city and regional planning. For this project, she was responsible for overall coordination of the community participation efforts.

Thomas E. Lisco, Ph.D.

Central Transportation Planning Staff (CTPS) - Traffic Forecasts

Mr. Lisco is a systems planning manager at CTPS. He has 15 years of experience in travel demand analysis and transportation project evaluation, and holds a doctorate degree in economics. For this project, Mr. Lisco was responsible for CTPS' development of traffic forecasts for all alternatives and participated in the evaluation of queuing on the highway facilities.

K. Meng Chng

Bolt Beranek & Newman Inc. - Air Quality Assessment

Mr. Chng has 17 years of experience in performing air quality analyses for various transportation and private industry projects, and has participated in more than two dozen environmental impact studies. He holds a Bachelor of Science degree in earth sciences. For this project, Mr. Chng was responsible for preparation of the air quality analysis of the proposed project, including documentation of existing conditions and modelling the future air quality characteristics of the area.

David A. Towers, P.E.

Bolt Beranek & Newman Inc. - Noise and Vibration Assessment

Mr. Towers is an acoustical engineer with more than nine years of experience. He has been involved in environmental assessments for noise and vibration control, community noise evaluation and assessment, and noise and vibration control for surface transportation systems. Mr. Towers holds advanced degrees in mechanical engineering and acoustics. For this project, Mr. Towers supervised noise and vibration tasks which involved data collection and analysis, evaluation of impacts, and preparation of those portions of the documents.

Carlton Noyes

Jason M. Cortell and Associates Inc. (JMCA) - Water Resources

Mr. Noyes, Director of the Water Quality Group at Jason M. Cortell and Associates Inc., has 16 years of experience in environmental consulting, principally in preparation of environmental impact statements, feasibility studies, and site plan documents. Mr. Noyes holds a Masters degree in zoology. For this project, Mr. Noyes was project manager for JMCA, responsible for documenting existing conditions and evaluating impacts on water resources, wetlands, vegetation and wildlife, and Harbor sediment characteristics.

Edward B. Kinner, Sc. D., P.E.

Haley & Aldrich, Inc. - Geotechnical Studies

Mr. Kinner is a geotechnical engineer and a principal and Senior

Vice President of Haley & Aldrich, Inc. As project manager for Haley & Aldrich's geotechnical efforts for this study, Mr. Kinner's responsibilities included determining the technical requirements for underpinning the existing elevated structure, the lateral support requirements of the Artery's excavation, and underpinning requirements for affected buildings. He also studied groundwater effects from the project and evaluated foundation requirements for the proposed structures. Mr. Kinner holds a Doctorate in civil engineering.

Francis X. Mahady

Economics Research Associates, Inc. (ERA) - Economic Assessment

Mr. Mahady, a Vice President and Boston Manager of ERA, has conducted numerous projects or studies in economic development, transportation, tourism and recreation, and real estate. For this project, Mr. Mahady directed ERA's economic assessment of impacts from all project alternatives. He holds a Masters degree in planning and economics.

Victor Impemba

Bryant Associates, Inc. - Right-of-Way Investigation

Mr. Impemba is a civil engineer with 15 years of experience working on a variety of projects involving highway and transit design, property investigation, and preparation of construction specifications and estimates. In this study, Mr. Impemba was involved in property research and preparation of right-of-way plans for the various alternatives.

Pauline C. Harrell

Boston Affiliates, Inc. - Historical Resources

Ms. Harrell, Vice President of Boston Affiliates, Inc., is a social and architectural historian with 13 years of teaching and consulting experience. She holds a Masters degree in history and is on the faculty at Boston University in the graduate program for preservation studies. Ms. Harrell supervised the historical resources inventory and impact assessment in the Third Harbor Tunnel and Central Artery study.

Russell J. Barber, Ph.D.

Institute of Conservation Archaeology (ICA) - Archaeological Resources

As Director of ICA, Dr. Barber was responsible for the overall review, research, and documentation for the Phase I archaeological investigation for the Third Harbor Tunnel and Central Artery study. Dr. Barber holds a Doctorate in archaeology. He has specialized in New England archaeology since 1971, and has published 20 articles and two books on the subject.

Neil Farmer

Ryan, Elliott Appraisal and Consulting Company, Inc. - Conceptual Appraisal and Real Estate Analysis

Mr. Farmer, Vice President of Ryan, Elliott Appraisal and Consulting Co. Inc., has over ten years of experience in real estate consulting and appraisal. He has worked with a wide variety of public and private clients throughout New England. For this project, Mr. Farmer supervised the firm's estimates of probable acquisition costs for various properties, estimated relocation resources, and helped to identify the availability of relocation space.

Anthony DiSarcina, P.E.

Segal/DiSarcina Associates
Consultant

A former director of CTPS, Mr. DiSarcina is currently a partner of Segal/DiSarcina Associates and specializes in traffic impact studies, preliminary design studies, traffic operations analyses, etc. He assisted the Joint Venture in the preparation

of the traffic analysis and highway design analyses for the Supplemental DEIS/DEIR. He holds a Masters degree in civil engineering.

The following individuals of HFMW A Joint Venture were also extensively involved in the engineering and environmental/planning analyses of the Third Harbor Tunnel/Depressed Central Artery study.

Administration

Robert Yarsites, HNTB
Carl Anderson, HNTB

Agency Liaison

Robert Kelly, FST

Engineering

Roy Andersen, HNTB
Francis Astone, CEM
Richard Azzalina, FST
Brian Barry, HNTB
Ed Chisholm, CEM
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Sergiu Luchian, HNTB
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Linda Ross, WFA
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Mariangela Satta, WFA
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Word Processing

Roberta Arcoleo, FST
Dawn Barkans, CEM
Rosemary Filosi, FST
Elizabeth Martin, WFA
Sharon Samek, FST

In addition, the consulting firm of Sverdrup & Parcel and Associates, Inc. in conjunction with Skidmore, Owings & Merrill, Vanasse/Hangen Associates, Inc., and Planning Innovations, Inc. was responsible for providing HFMW with preliminary supplemental engineering and traffic data for this project related to Alternative 5A Modified.

Thomas Regan, P.E.
Sverdrup & Parcel and Associates, Inc.

Mr. Regan, a Vice President of Sverdrup & Parcel and Associates, Inc. served as project executive and coordinator for his team's work on preliminary Alternative 5A modifications, and was responsible for its tunnel design portions. Mr. Regan has 35 years of engineering experience and holds a Masters degree in structural engineering.

ichard E. Hangen, P.E.
anasse/Hangen Associates, Inc.

Mr. Hangen is a principal at anasse/Hangen Associates, Inc. and pecializes in traffic engineering. or the preliminary study of odifications to Alternative 5A, he irected Vanasse/Hangen's efforts in ormulating the conceptual development f the proposed modification and the ubsequent traffic analyses performed n assistance of CTPS's traffic orecasts during the SDEIS/SDEIR and EIS/FEIR phases. Mr. Hangen holds a asters degree in Civil Engineering.

aren B. Alschuler
kidmore, Owings & Merrill, Inc.

Ms. Alschuler, an associate partner at Skidmore, Owings & Merrill, Inc. with 15 years of planning experience, has directed numerous environmental impact statements, feasibility studies, and other projects in urban planning and community development. Ms. Alschuler acted as project manager for the urban design and land use components of the S&P team's Alternative 5A modification study. She holds a Masters degree in city planning.

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BIBLIOGRAPHY

The below-referenced documents constitute the major past reports dealing with the Third Harbor Tunnel Project and related improvements to the Central Artery. This is a general bibliography only; the reader is asked to refer to the bibliographies contained in the Technical Appendices and Supplemental Reports of the DEIS/DEIR (December 1982), Supplemental DEIS/DEIR (June 1983), and this FEIS/FEIR for subject-specific reference sources (e.g., traffic, air quality, land use, etc.).

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